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PARAMETRIC INVESTIGATION OF THE Na-N_2O + CO CHEMICAL LASER

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Johns Hopkins University

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The effects of several parameters on the gain of the $Na-N_2O$+CO chemical laser system have been studied. The chemical reaction mechanism in its simplest form consists of the following reaction chain:

$$Na + N_2O \rightarrow N_2 + NaO + 21.0 \text{ kcal/mole}$$

$$NaO + CO \rightarrow CO_2 + Na + 66.2 \text{ kcal/mole.}$$

The reaction proceeds rapidly at room temperature, accompanied by intense sodium D-line chemiluminescence. At low combustion efficiencies (10 to 20%) and an excess of N_2O, the system lases at 10.8μ with N_2O as the optically active species. The diluent is helium, which is the carrier of the sodium vapor derived from thermally decomposing the easily handled NaN_3 powder. In a

(Block 20 continued)

output is designed to assist the logistics analyst in assessing shipping and port operations. Output summaries for each port include its use by each ship and the amount of cargo that entered and left the port.

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ABSTRACT

The REACT II computer program simulates port and shipping operations for movement of cargo by sealift. Port and berth characteristics, ship types and characteristics, cargo types and amounts, and shipping routes are input.

Model output consists of cargo generated and delivered by type and port, ship and port utilization, and ship operating costs. The model output is designed to assist the logistics analyst in assessing shipping and port operations. Output summaries for each port include its use by each ship and the amount of cargo that entered and left the port.

SECTION 1

INTRODUCTION

A computer simulation model known as REACT, an acronym for Requirement Evaluated Against Cargo Transportation,[1*] was developed by Research Associates Incorporated for the Integrated Sealift Study to simulate the movement of ships transporting cargo among ports. The purpose of REACT was to establish the interrelationships among the number and types of ships and their delivery patterns and schedules in sealift operations in order to satisfy time-phased cargo requirements.

As new applications arose, the REACT computer program was modified, but these changes were never fully documented. Consequently, in order to interpret REACT results accurately, it was necessary to examine these changes and to make corrections and additional revisions to meet current needs. The revised version, designated REACT II, is documented in this report in complete form. Individual modifications are not identified.

This report describes the overall operation of the model and its subroutines, its system characteristics, input, and output. A general description of the original REACT model is provided in Appendix A.

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*A complete listing of references is given on page 99.

SECTION 2

SYSTEM CHARACTERISTICS

2.1 OVERVIEW

In the simulation of sealift operations with the REACT II model, cargo is generated at designated ports of embarkation (POE's). As ships arrive, the cargo is loaded and the ships then sail to destination ports where cargo is unloaded. The ships then sail to other POE's, loading and unloading cargo on their routes. The cycle continues until all the cargo has been delivered.

Since all ports cannot accommodate all types of ships and all ships cannot accommodate all types of cargo, restrictive criteria are input to the simulation model. Figure 1 represents the interrelationships of ships, ports, and cargo in the system. The intersections of two circles represent (a) cargo types that can be handled at each port, (b) cargo types that can be carried by each type of ship, and (c) ship types that can enter each port. The intersection of all three circles represents (d) ship operations that satisfy all input conditions, i.e., ships carrying acceptable cargo loading or unloading at acceptable ports.

2.2 SHIP CHARACTERISTICS

2.2.1 Ship Description

Ships are defined as specific types according to the following characteristics:

- Cargo types the ship can carry
- Cargo capacities in weight (long tons) and volume (measurement tons)
- Draft at full load (feet)
- Sustained speed (knots)
- Daily costs of operation in port and at sea (dollars)
- Transfer system(s) used, with an adjustment factor for multitransfer systems (see Cargo Handling Rates, Section 2.4.4)

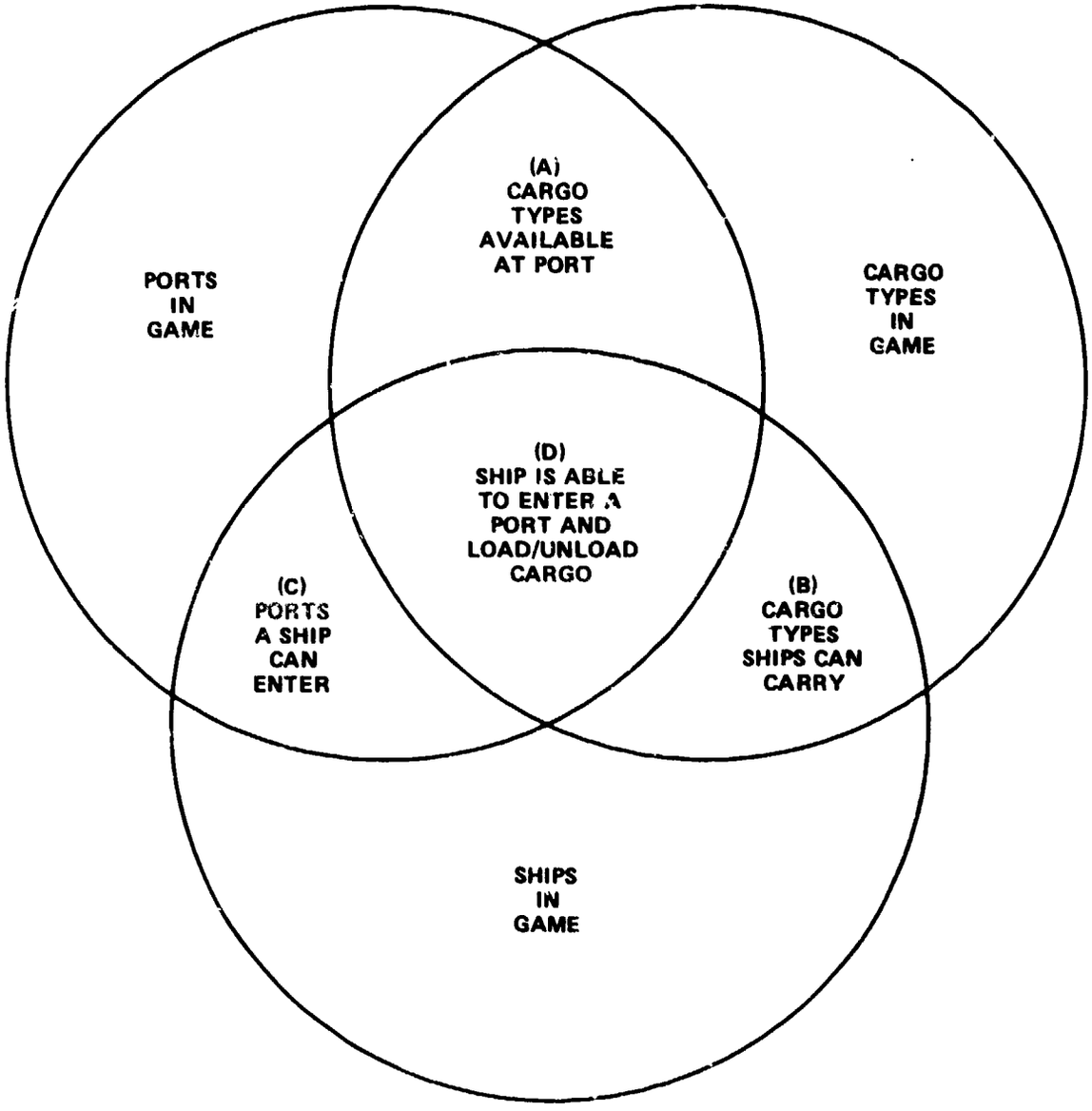

Figure 1 - Interrelationships among Cargo, Ships, and Ports

- Port berthing preferences (see Berth Selection and Queue Operation, Section 2.3.2)
- Capability to change home or delivery theater when leaving the ship pool (see Ship Pool, Section 2.2.3)

Initially each ship in the system is assigned a ship type, a time at which it becomes available to transport cargo, and a routing schedule which defines the group of ports it may enter. In the simulation a ship loads only acceptable cargo destined for a port which meets the following requirements: (1) it has a facility the ship may berth at, (2) it is on the ship's routing schedule, and (3) it has a depth greater than the ship's draft.* The ship is loaded to 80 percent of its volume capacity unless that amount is greater than its weight capacity, in which case the ship is loaded to its weight capacity.

2.2.2 Ship Routing

The model allows three different types of ship routing. A ship assigned an itinerary travels to ports on a pre-determined route. An itinerary is defined as an ordered set of not more than ten ports. The model can accommodate ten itineraries.

Ships not assigned itineraries travel to theaters where cargo is available. A theater is a group of ports in a geographical area. A non-itinerary ship may be either an intratheater or intertheater ship. An intratheater ship travels within a theater; an intertheater ship travels between theaters.

2.2.2.1 Itinerary Shipping. Ships assigned to operate on a particular itinerary visit the specified ports in the order in which the ports are input to the itinerary. On reaching one of these ports, a ship discharges cargo identified for that port. Cargo destined for ports on the ship's itinerary and acceptable for that ship type is loaded aboard the ship. Itinerary ships operate continuously and never enter the "ship pool."

---

*Although the model has the capability to examine draft, this function is not used in the present version.

2.2.2.2 Intratheater Shipping. Intratheater ships load cargo only for those ports which are in the same theater as the port generating the cargo. Therefore, when an intratheater ship enters a port and discharges any cargo aboard for that port, a search is made only for acceptable cargo to be delivered in the same theater. After this cargo, if any, is loaded, the ship heads for the nearest port for which it has cargo. If there is no cargo aboard, a check determines whether there is any intratheater cargo at any port in theater that needs to be shipped. The port which has the largest amount of such cargo becomes the next port to be visited by the ship. If there is no port with intratheater cargo, the ship joins the ship pool.

2.2.2.3 Intertheater Shipping. Ships assigned to this type of operation load cargo that is generated in one theater for delivery to another theater. When a ship reaches a port, it first discharges any cargo deliverable to that port. Subsequent actions depend on whether the ship is in its delivery theater or its home theater, both of which are inputs for each intertheater ship. In the model, the home theater is the one that contains the home port of the ship; the delivery theater is the one for which the ship is loading cargo when in its home theater.

When a ship is in its home theater searching for cargo to load for its delivery theater, the following questions must be answered:

- Is the cargo acceptable for this ship?
- Is the depth of the destination port compatible with the ship draft?
- Does the destination port for this cargo have an acceptable unloading facility?

After all cargo meeting the above criteria is loaded, the ship sails for the closest port in the home theater for which it has retrograde cargo aboard. Retrograde cargo is cargo scheduled for delivery to a port in the home theater. This cargo was loaded in the ship's delivery theater. If there is no retrograde cargo aboard and the ship is at least 80 percent full, it sails for the closest port in its delivery theater.

If the ship's current load volume is between 20 percent and 80 percent of capacity, a check is made to determine whether the time in current operations in the home theater has exceeded 1/3 of the input cycle time between

the home theater and delivery theater of the ship. If so, the ship sails for the closest port in its delivery theater for which it has cargo.

If the ship is under 80 percent loaded and less than 1/3 of the cycle time has expired, or if the ship is under 20 percent loaded even when more than 1/3 of the cycle time has expired, the ship searches the other ports in its home theater for cargo destined for its delivery theater. If it finds acceptable cargo amounting to at least 500 measurement tons, the ship sails for that port to load that cargo. If no such port is found, a check is made to determine whether the ship has any cargo aboard. If there is no cargo aboard, the ship retires from operations and joins the ship pool. If the ship has any cargo at all, it sails to the ports in the delivery theater for which it has cargo aboard.

When a ship is at a port in its delivery theater, all cargo to be delivered to that port is discharged and acceptable cargo to be delivered to a port in the home theater is loaded. If more cargo is aboard for other port(s) in the delivery theater, the closest such port is selected as the next port of call for the ship. If there is no cargo aboard, the ship returns to its home port.

Intertheater ships may also operate as intratheater ships. This situation occurs when the next destination port of an intertheater ship is within the same theater as the current port. If it is, a check determines whether intratheater cargo exists at the current port for delivery to the next port of call. If so, and if the cargo is of an acceptable type, that cargo is also loaded at the current port.

2.2.3 Ship Pool

The model provides for a pool of ships. Ships enter the pool for one of two reasons:

1. Some ships are assigned to the pool at the start of the simulation and are available for operations at day 30. This feature may be useful in automatically allocating ships on a delayed basis.

2. The ships were previously in normal operations and entered the pool because there was no cargo to be delivered for which they were eligible carriers. Ships remain in the pool for the period of time specified in the input.

A check every seven days determines whether cargo delivery requirements during the work week warra : the removal of any ships from the pool. This check establishes an array, A(i,j), (i represents the home theater and j the delivery theater) which represents cargo awaiting delivery for which shipping is not presently available. The array is established by the following steps:

- Tabulate the current amount of cargo waiting to be moved from one theater to another or within a theater
- Determine which ships presently operating will be available to transport cargo during the following week
- Compute A(i,j) by subtracting the capacity of these available ships from the appropriate entry in the array of cargo to be delivered

If any of the entries A(i,j) are greater than 10,000 measurement tons, the pool is searched for ships that may transport the cargo. Ships are removed from the pool in the order in which they meet the following requirements:

- Ships having home theater "i" and delivery theater "j"
- Ships having home theater "i" and the capability of changing delivery theater
- Ships having the capability of changing home and delivery theaters

If a ship satisfies one of the above criteria, it is removed from the pool provided at least 500 measurement tons of acceptable cargo are available at theater "i."

When a ship is selected from the pool, it is considered available at its new home port immediately. It is assumed that the need for the ship will have been established early enough to give the ship time to reach its initial port.

2.3 PORT CHARACTERISTICS

2.3.1 Port Description

The following inputs are required to define each port:

1. Number of berths of each of six types at the port.
2. Theater in which the port is situated.
3. Maximum acceptable ship draft.

(1,2, and 3 above restrict the ship types that may enter the port.)

4. Miscellaneous port delay (time in days) -- Represents time needed to service the ship at that port.
5. Cargo handling adjustment factor -- Used to modify the base cargo handling rate to reflect the efficiency of cargo handling operations at the port and the number of shifts worked.
6. Cargo handling costs (dollars per day) -- Represents the direct charges associated with cargo handling operations at the port.
7. Name of the port -- Used in the summary output for port identification.

Distances between ports are also input and are needed to calculate the amount of time spent traveling, the cost of travel, and in some cases, to determine the port to which the ship will travel.

2.3.2 Berth Selection and Queue Operation

When a ship reaches a port, it must determine which type of berth to enter (see Section 5.14 for berths used). Since provision is made to input preferred berth types for each ship, a check is made of the preference sequence. If there is a preferred berth type, the ship enters that type if it is available. If it is not available, a check is made to determine whether a second preference is indicated. If so, and that type is available, the ship enters that type. If that type is not available, or if there is not a second preference, the ship joins the queue, or waiting line, to await service for the preferred type.

If there are no input berth type preferences, the model determines the berth type to be used on the basis of the cargo handling rate at each berth. Computations are made to determine which berth type at the port would result in the maximum discharge rate for the type of cargo aboard. If that type

is available, the ship enters the berth. If it is not available, the model determines which of the available types has the greatest discharge rate. If that rate is at least an acceptable percentage (an input) of the previously computed maximum rate, that berth type is used by the ship. If an acceptable facility cannot be found on this basis, the ship enters the queue to await service at the berth type which has the maximum rate. If within the queue at a given port more than one ship is waiting for the same berth type, the ships are removed in the order in which they entered the queue.

2.4 CARGO CHARACTERISTICS

2.4.1 Cargo Types

DOD material is classified in terms of various supply commodities, e.g., Subsistence; Clothing; Petroleum, Oil and Lubrication (POL); Ammunition; Major End Items. A single supply commodity or a combination of commodities with similar characteristics is referred to in REACT II as a cargo type. Supply commodities can be combined when they have similar methods and rates of handling, storage requirements, and ratios of volume (measurement tons (MT)) to weight (long tons (LT)), MT/LT.

2.4.2 Cargo Generation

The buildup of cargo at a port is simulated by cargo generation. Input parameters for cargo generation are:

- Time of generation
- Frequency of generation
- Amount and type of cargo
- Origin and delivery ports

These parameters establish a schedule for cargo generation. Cargo may be generated only once or at regular intervals. The model allows for one change in the frequency of the interval during a given simulation run. Factors which control the schedule of cargo generation are:

- First day of generation
- Frequency of generation
- Day on which frequency changes
- New frequency
- Last day of generation

2.4.3 Cargo Transfer Systems

The REACT II model accommodates six different cargo transfer systems, one or more of which are associated with each ship type. A transfer system refers to the network of equipment used to load and unload a ship and includes equipment both at the port and on the ship. A given transfer system is used only at a specific type of berth. The productivity rate of a transfer system/berth combination includes the type of cargo to be handled and is input through a three-dimensional array (cargo, transfer system, and berth). For those combinations which are not valid, a zero is entered in the array.

When a ship arrives at a port, the berth providing the highest cargo handling rate is chosen. To select the berth the model may query the array or follow the user's input for the ship's first and second choices for berth types.

2.4.4 Cargo Handling Rates

The productivity rate is the amount (in measurement tons) of cargo of a particular type that may be discharged per 8-hour shift from a ship in a particular type of berth and using a particular transfer system. The rate at which a ship's cargo is loaded or discharged is a function of the base handling rate and adjustment factors (Section 5.4). The base rate may be either a single productivity rate or the sum of appropriate rates when more than one transfer system is used. (The summing of rates implies independent operation of transfer systems.) The base rate is derived from the productivity rate array and is adjusted, as required. Adjustments to productivity rates reflect that

1. Cargo may be unloaded and loaded at different rates. If the adjustment factor is other than unity, different rates will be used for the two operations.

2. Different ports can have different cargo movement rates even when all other factors are equal. For each port the base rate is adjusted by an input value.

3. Cargo may not be handled at the assigned rate when more than one ship transfer system is being utilized. An input factor accounts for independence of, or interference between, the transfer systems.

The time required to move cargo is a function of this adjusted rate and the amount of cargo to be moved.

Since a ship may carry more than one type of cargo, the time required to handle each cargo type must be computed and summed to give the total time for handling the cargo.

Since a ship may encounter miscellaneous delays at a port, a delay time is input for each port. The total time in port is the sum of this delay time and the time required for load/discharge operations.

2.5 COSTS

The model determines total system costs on a cumulative basis. These costs include the direct operating costs of the ship in port and at sea and the handling costs associated with the movement of cargo. The model requires as input: (1) the costs at sea and costs in port for a particular ship type, (2) administrative costs associated with each type of ship owner,* and (3) cargo handling costs for a given port. Each of these costs is input in dollars per day. Contributions to the total system costs for each ship (except owner type 1 ships, Berth Liner) are as follows:

- For each day in transit, operating costs at sea as a function of the ship type.
- For each day in port, operating costs as a function of ship type and cargo handling costs as a function of the individual port.
- For each day spent in the queue awaiting port service, costs on the basis of ship type.
- For each day of operation, in transit, in port, and in queue, the administrative costs as a function of the ship owner.

For owner type 1 ships, the only contribution to system costs is the cost per measurement ton per thousand miles for cargo (by type) delivered. No costs are accumulated for ships in the pool.

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*Up to six different ship owner types are allowed in the program. Section 5.6 indicates those presently used.

SECTION 3

SYSTEM OUTPUT

REACT II simulates only the shipping operations being studied; no optimal solution is computed. From the output statistics, the simulated shipping operation can be analyzed.

The output of REACT II is composed of two parts: paper listing and punched cards. The paper listing consists of three sections, Model Input Listing, Ship Event History, and System Status Summary.

The Input Listing is useful in validating the input from punched cards and also describes the system to which the output applies.

The Ship Event History is a chronological record of the ships' actions and is useful in reconstructing the sequence of events during the run. The Event History includes the time a ship enters and leaves a queue, port, or ship pool, and the information associated with each event. Production of the Event History is optional; its suppression produces a shortened version of System Status Summary.

The System Status Summary is printed both periodically and at the completion of the run. It includes cumulative costs, the current number of ships in the pool, and port information. From this output, an analyst can determine whether the berthing facilities at a specific port are adequate, or whether the given number of ships is capable of meeting the cargo movement requirements.

The model also produces punched cards for input to an external program which graphs the results. A card is made for each day shown in the printed System Status Summaries. Each card contains the day the values are calculated and cumulative information describing, by class, cargo generated, cargo shipped, and cargo delivered. A sample output is given in Appendix B.

SECTION 4

THE PROGRAM

The REACT II model is composed of eleven Fortran IV subroutines. Each subroutine has a particular function, which is performed at a specific time determined either by input or by a previous operation. Figure 2 shows the organization of the REACT model.

4.1 DEFINITION OF EVENT

The requirement for a specific operation (such as the arrival of a ship at a port, or the generation of cargo at a port) schedules an event which is to occur at a later time. The event is said to occur when the operation has been performed (ship arrives, or cargo is generated). At that time decisions for subsequent events are made.

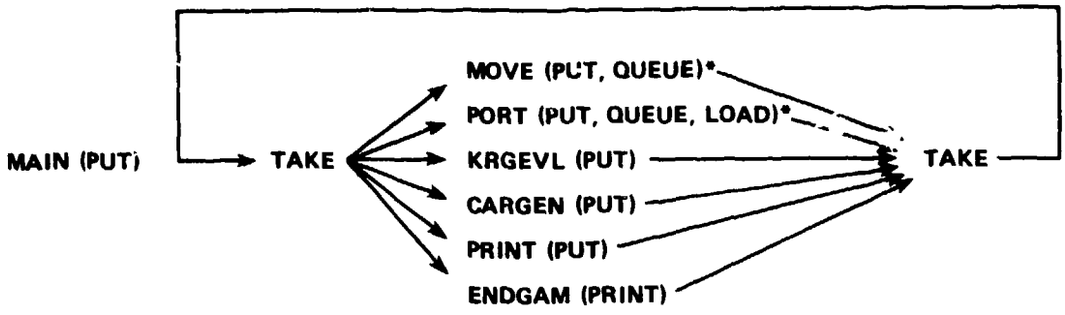
The major events in ship operations and the subroutines performing them are listed in Table 1.

TABLE 1 - MAJOR EVENTS

Event	Subroutine
Cargo Generation	CARGEN
Ship Enters Port	PORT
Cargo Loaded	LOAD
Ship Leaves Port	MOVE
Ship Transported To Port	
Remove Ship from Pool	KRGEVL
If Conditions Satisfied	
Print Output	PRINT
Terminate Execution	ENDGAM

4.2 EVENT LIST

The scheduling of events in the model during the simulation requires a bookkeeping system. The system consists of an event list and operations which (1) store events on the list as they are generated, and (2) remove events from the list at the appropriate times throughout the simulation.



*IN CASE OF ABNORMAL TERMINATION, CONTROL IS TRANSFERRED TO ENDGAM. WHEN SUBROUTINES IN PARENTHESIS ARE CALLED, CONTROL RETURNS TO THE CALLING SUBROUTINE.

Figure 2 - Subroutine Flow

The event list contains references to the locations in the computer used to store events generated during the simulation. Along with each event is stored the time at which it will occur and its description. The events are arranged on the list chronologically by their simulated occurence times. Subroutine PUT stores events on the event list. An event is simulated by removing the event from the event list. Subroutine TAKE removes events from the event list. The appropriate subroutine is then entered to perform the required functions. For example, removing a cargo generation event from the list simulates the generation of a quantity of cargo specified in the input.

The initial Event List, which is formulated in Subroutine MAIN, is composed of the following events:

- Cargo generation check on day 1
- The first day the System Status report is to be printed
- The day each ship will be available at its origin port
- The first day the pool is to be checked
- The day the mission is to terminate

The events are stored in the order in which they are to occur along with ship numbers for those events involving ships.

From MAIN control is transferred to TAKE which removes the first event from the event list and transfers control to the appropriate subroutines. Once TAKE has been called, control is not returned to MAIN. Subsequently, additional events are placed on the event list to simulate ship operations. For instance, when a ship is available, a MOVE event is generated representing the movement of the ship to the port at which cargo has been generated by a CARGEN event. A PORT event simulates the ship entering the port and a LOAD event simulates loading of the ship.

4.3 SUBROUTINE DESCRIPTIONS

CARGEN generates cargo as specified by input. It is called on day 1 to generate the appropriate cargo. The "next day" cargo to be generated is determined and a new entry for the Event List is created.

ENDGAM terminates execution. Normally termination is at a day specified by input, but abnormal termination may occur earlier and an error message is then printed. ENDGAM also prints additional summary information.

KRGEVL evaluates the need to remove ships from the pool every seven days. If all criteria are met (see Section 2.2.3), a ship is removed from the pool and sent to the appropriate port (a new entry to the Event List).

LOAD loads cargo on ships, updates costs, and returns control to PORT.

MAIN reads the input data, initiates storage areas, formulates the initial event list, and writes the data inputs.

MOVE determines the time at which a ship will arrive at its destination port and sets up a PORT event for that day. If the ship is not to be sent to a port, MOVE adds it to the ship pool. MOVE also determines whether any ships are in the queue for the facility that the ship is leaving. If so, PORT events for the ships in the queue are generated.

PORT is the central control mechanism for ship cargo handling activities. This subroutine

1. Determines the berth a ship is to enter. If a berth is not available, the ship enters the queue and control is transferred to TAKE.
2. Unloads cargo.
3. Determines acceptable cargo.
4. Updates costs.
5. Tabulates cargo handling time.
6. Determines next destination port and sets up a MOVE event for the time at which the ship is to leave the port.

PRINT prints out the Status Summary Report. A PRINT event occurs at the current time plus the print interval specified in the input.

PUT enters events on the event list in chronological order.

QUEUE maintains a list of ships waiting to enter a particular berth type at a given port.

TAKE removes an event from the event list and transfers control to the appropriate subroutine.

SECTION 5

MODEL INPUT

Parameters required for execution of REACT, summarized in Table 2, are input on cards. Cards must be input in the order given in the table. The following sections describe the individual card formats.

5.1 PRODUCTIVITY RATES

These cards contain base rates used in calculating the amount of time a ship will spend in cargo handling operations at each port. The productivity rate is defined as the amount (in measurement tons) of a particular type of cargo that may be discharged per 8-hour day from a ship at a particular berth type and using a particular cargo transfer system.

PRODUC(I,J,K) where:

I is the berth type number (1 to 6)

J is the cargo transfer system number (1 to 6)

K is the cargo type number (1 to 8)

COLS 1-48	COLS 49-72	COLS 73-80
Card 1 PRODUC (1,1,K) K=1,8	blank	PROD
Card 2 PRODUC (1,2,K) K=1,8	"	"
.		
.		
.		
Card 6 PRODUC (1,6,K) K=1,8	"	"
Card 7 PRODUC (2,1,K) K=1,8	"	"
.		
.		
.		
Card 35 PRODUC (6,5,K) K=1,8	"	"
Card 36 PRODUC (6,6,K) K=1,8	"	"

Each productivity rate has an F6.0 format.

TABLE 2 - INPUT CARD REQUIREMENT SUMMARY

Data On Card(s)	Card Name	Number of Cards
1. Productivity rates	PROD	36
2. Distances	DIST	90
3. Cycle time	KKTME	1
4. Adjustments	ADJUST	1
5. Cost per ton	CSTTON	1
6. Administrative costs	CSTADM	1
7. Number of itineraries	NITIN	1
8. Itinerary	ITIN	NITIN
9. Run identification	IDENT	1
10. General information	GENERAL	1
11. Ports printed	REPORT	1
12. Number of cargo generations	NKOGOGN	1
13. Cargo generations	CGEN	NKGOGN
14. Port information	PORT	NNPORT*
15. Ship type	ST	NTYPE*
16. Ship identification	SHIP	NSHIP*/4
17. Manipulation	MANIP	4

*These values also appear on the GENERAL information card, Card 10.

5.2 DISTANCES

These cards contain the distances, in nautical miles, between any two ports. These distances are used to compute sailing times for nonitinerary ships.

DIST(I,J) where:

I is the origin port number (1 to 30)

J is the destination port number (1 to 30)

COLS 1-60	COLS 61-72	COLS 73-80
Card 1 DIST (1,J) J=1,10	blank	DIST
Card 2 DIST (1,J) J=11,20	"	"
Card 3 DIST (1,J) J=21,30	"	"
Card 4 DIST (2,J) J=1,10	"	"
.		
.		
.		
Card 90 DIST (30,J) J=21,30	"	"

Each distance has an F6.0 format.

5.3 CYCLE TIME

This card contains the cycle times (in days) for intertheater ships. The values on this card are used in the model to keep the ships cycling between their home and delivery theaters at regular intervals. A ship is allowed to search for cargo in its home theater for a maximum of one-third of the input cycle time.

KKTIME(I,J) where:

I is the home theater number (1 to 6)

J is the delivery theater number (1 to 6)

COLS	FORMAT	NAME	DESCRIPTION
1-12	6I2	KKTIME (1,J) J=1,6	Cycle times
13-23	6I2	KKTIME (2,J) J=1,6	Cycle times
•			
•			
•			
61-72	6I2	KKTIME (6,J) J=1,6	Cycle times
73-80	A	"KKTIME"	Card name*

Each cycle time has an I2 format.

5.4 ADJUSTMENTS

Various miscellaneous factors are defined.

COLS	FORMAT	NAME	DESCRIPTION
1- 6	F6.0	ADJLD	Load adjustment factor[1]
7-12	F6.0	TTRAN	Transit time to or from ship pool
13-18	F6.0	ADJRAT	Queue adjustment[2]
19-24	F6.0	ADJCGO (1)	Conversion factor[3] for cargo type 1
25-30	F6.0	ADJCGO (2)	Conversion factor for cargo type 2
31-36	F6.0	ADJCGO (3)	Conversion factor for cargo type 3
37-42	F6.0	ADJCGO (4)	Conversion factor for cargo type 4
43-48	F6.0	ADJCGO (5)	Conversion factor for cargo type 5
49-54	F6.0	ADJCGO (6)	Conversion factor for cargo type 6
55-60	F6.0	ADJCGO (7)	Conversion factor for cargo type 7
61-66	F6.0	ADJCGO (8)	Conversion factor for cargo type 8
67-72	-	-	Blank
73-80	A	"ADJUST"	Card name

*The card name KKTIME is punched in columns 73-80.

NOTES: 1. The load adjustment factor is used to convert input productivity rates (discharge rates) into loading rates. A value of "1" indicates that loading and unloading takes place at the same rate. Fractional values indicate a slower rate for loading; values greater than one indicate a faster rate for loading. 2. An input fraction is used as a criterion (by ships not having a berth preference) to determine whether to queue at an occupied berth having the highest productivity, or to enter an available berth with a lower productivity rate. The productivity rate at the available berth type must be at least this input fraction of the highest productivity rate at this port. The higher the value, the more selective ships will be in their search. This may cause the ships to queue for long periods at a port. 3. This factor (values of 0.01 to 10000) is used to convert volume (measurement tons (MT)) to weight (long tons (LT)).

5.5 COST PER TON

This card contains eight values representing the costs per measurement ton (MT) per thousand miles shipped for the eight cargo types carried by ships of owner Type 1, berth liner. Costs (dollars) may range from 0 to 99999.

COLS	FORMAT	NAME	DESCRIPTION
1- 6	F6.0	CSTTON (1)	Cost per MT of cargo type 1
7-12	F6.0	CSTTON (2)	Cost per MT of cargo type 2
•			
•			
•			
43-48	F6.0	CSTTON (8)	Cost per MT of cargo type 8
49-72	-	-	Blank
73-80	A	"CSTTON"	Card name

5.6 ADMINISTRATIVE COST

This card contains the daily administrative costs in dollars for the six ship owner types. Values may range from 0 to 99999.

COLS	FORMAT	NAME	DESCRIPTION
1- 6	F6.0	CSTADM (1)	Owner Type 1 (Berth Liner)
7-12	F6.0	CSTADM (2)	Owner Type 2 (Military Sealift Command (MSC))
13-18	F6.0	CSTADM (3)	Owner Type 3 (General Agency Agreement)
19-24	F6.0	CSTADM (4)	Owner Type 4 (Requisition/Nationalistic)
25-30	F6.0	CSTADM (5)	Owner Type 5 (Self-Sustaining Container)
31-36	F6.0	CSTADM (6)	Owner Type 6 (Nonself-Sustaining Container)
37-72	-	-	Blank
73-80	A	"CSTADM"	Card name

5.7 NUMBER OF ITINERARIES

The value of NITIN must correspond to the number of itinerary cards (Section 5.8).

COLS	FORMAT	NAME	DESCRIPTION
1-10	I10	NITIN	Number of unique itineraries (values of 0 to 10)
11-72	-	-	Blank
73-80	A	"NITIN"	Card name

5.8 ITINERARY

One card is required for each itinerary specified in Section 5.7. Itinerary numbers are assigned by input order.

COLS	FORMAT	NAME	DESCRIPTION
1-10	I10	-	Number of ports on the itinerary from 1 to 10
11-12	I2	-	Number of 5th port on Itinerary[1]

COLS	FORMAT	NAME	DESCRIPTION
13-14	I2	-	Number of 4th port on Itinerary[1]
15-16	I2	-	Number of 3rd port on Itinerary[1]
17-18	I2	-	Number of 2nd port on Itinerary[1]
19-20	I2	-	Number of 1st port on Itinerary[1]
21-22	I2	-	Number of 10th port on Itinerary[1]
23-24	I2	-	Number of 9th port on Itinerary[1]
25-26	I2	-	Number of 8th port on Itinerary[1]
27-28	I2	-	Number of 7th port on Itinerary[1]
29-30	I2	-	Number of 6th port on Itinerary[1]
31-32	I2	-	Sailing time from 4th to 5th[2] port
33-34	I2	-	Sailing time from 3rd to 4th port
35-36	I2	-	Sailing time from 2nd to 3rd port
37-38	I2	-	Sailing time from 1st to 2nd port
39-40	I2	-	Sailing time from 10th to 1st port
41-42	I2	-	Sailing time from 9th to 10th port
43-44	I2	-	Sailing time from 8th to 9th port
45-46	I2	-	Sailing time from 7th to 8th port

COLS	FORMAT	NAME	DESCRIPTION
47-48	I2	-	Sailing time from 6th to 8th port
49-50	I2	-	Sailing time from 5th to 6th port
51-72	-	-	Blank
73-80	A	"ITIN"	Card name

NOTES: 1. A ship sequences from the first port thro h the last port, and then back to the first port. The same sequence is followed until all cargo is delivered. If fewer than 10 ports are used, the remaining port entries are 0 or blank. 2. Sailing time (in days) may range from 1 to 99.

5.9 RUN IDENTIFICATION

This card contains a 72-character alphanumeric label to identify the run.

COLS	FORMAT	NAME	DESCRIPTION
1-72	A	-	Identifying label
73-80	A	IDENT	Card name

5.10 GENERAL INFORMATION

COLS	FORMAT	NAME	DESCRIPTION
1- 9	I9	NSHIP	Number of ships*
10-18	I9	NSTYPE	Number of ship types*
19-27	I9	NNPORT	Number of ports*
28-36	I9	NFTYPE	Number of berth types
37-45	I9	NTHEA	Number of theaters
46-54	I9	IOUT	Output Indicator If IOUT=0, a shortened version of System Status Summaries will be presented. If IOUT=1, System Status Summaries and Event Histories will be printed.

*Must agree with cards described in the following sections.

COLS	FORMAT	NAME	DESCRIPTION
55-60	F6.0	TEVAL	Time interval between System Status Summary printouts
61-66	F6.0	TSTOP	Maximum game time (limited to 320 days)
67-72	F6.0	TDEL	Time delay before first cycle of System Status Summary. First printout is at "TDEL+TEVAL" days
73-80	A	"GENERAL"	Card name

5.11 PORTS PRINTED

This card contains the numbers of ports included in the System Status Summaries.

COLS	FORMAT	NAME	DESCRIPTION
1- 2	I2	IKE (1)	Port number
3- 4	I2	IKE (2)	Port number
•			
•			
•			
73-80	A	"REPORT"	Card name

Port numbers are entered in ascending order.

5.12 NUMBER OF CARGO GENERATIONS

The value of NKGOGN on this card must be the same as the number of cargo generation cards.

COLS	FORMAT	NAME	DESCRIPTION
1-10	I10	NKGOGN	Number of cargo generations
11-73	-	-	Blank
73-80	A	"NKOGN"	Card name

5.13 CARGO GENERATIONS

These cards describe the types of cargo generated by quantity, frequency, generating port, and delivery port. One card is required for each cargo generation.

COLS	FORMAT	NAME	DESCRIPTION
1- 3	I3	KGOGN1(I)	Last day cargo is to be generated
4- 6	I3	-	1st day cargo is to be generated
7- 8	I2	-	Interval (days between generations)
9	-	-	Blank
10	I1	-	Cargo Type
11-12	I2	-	Port generating cargo
13-14	I2	-	Delivery port
15-19	I5	KGOGN2(I)	Blank
20-24	I5	-	Amount of cargo generated
25-29	I5	KGOGN4(I)	Blank
30-32	I3	-	Day frequency changes
33-34	I2	-	New interval (must be a multiple of the old interval)
35-72	-	-	Blank
73-80	A	CGEN	Card name. CGEN1 for first cargo generation, CGEN2 for second, etc.

NOTE: Cargo generations are ordered in the input deck first by generating port number (Cols. 11-12) and second by delivery port number (Cols 13-14). For each originating port, the cargo type must be in ascending order. For example, if Port 3 generates cargo types 3, 6, and 4, the cargo types must be in the order 3, 4, and 6. If this ordering is not followed, erroneous output statistics will result.

5.14 PORT INFORMATION

These cards describe the characteristics of each port in the simulation. The number of these cards must correspond to the input value "NNPORT" on the "GENERAL" card.

COLS	FORMAT	NAME	DESCRIPTION
1- 3	I3	NFPRT1(I)	Number of berths type 3 (Lighterage berth)
4- 6	I3	-	Number of berths type 2 (Self-sustaining container berth)
7- 9	I3	-	Number of berths type 1 (Break bulk berth)
10-12	I3	NFPRT2(I)	Number of berths type 6 (Nonself-sustaining container berth)
13-15	I3	-	Number of berths type 5 (Not used)
16-18	I3	-	Number of berths type 4 (RoRo berth)
19	I3	ITHPRTT(I)	Theater of port
20-25	F6.0	TDLA(I)	Port delay[1]
26-31	F6.0	ADJPRT(I)	Adjustment factor for productivity rates[2]
32-37	F6.0	CSDTHDL(I)	Cost of cargo handling[3]
38-40	F6.0	DFTRPT(I)	Maximum allowable ship draft
44-55	2A6	PRTNAM	Twelve-character name of port. This label will be printed on output Status Summary Report.
56-72	-	-	Blank
73-80	A	PORT#	Card name. PORT1 for first port, PORT2 for second, etc.

NOTES:

1. TDLA--Port delay time (in days) encountered by all ships using this port, with values 0 to 999.

2. ADJPRT--Adjustment factor (values of 0 to 99) applied to productivity rates reflecting the cargo handling capabilities of each port. A fractional value will reduce productivity rates. This modifier is used for multiple shift operations.

3. CSTHDL--Cargo handling cost (in dollars per day) used in computing the costs for both loading and unloading operations for all types of cargo (values of 0 to 99999).

5.15 SHIP TYPE

These cards describe the ship types. There must be one card for each ship type used in the model and the number of these cards must correspond to the value NSTYPE on the GENERAL card.

COLS	FORMAT	NAME	DESCRIPTION
1- 8	F9.0	SPEED	Speed (knots) of ship type
9-16	F8.0	CAPACW	Cargo capacity (weight) in long tons (values of 0 to 99999)
17-24	F8.0	CAPACV	Cargo capacity (volume) in measurement tons (values of 0 through 99999)
25-32	F8.0	CSTSEA	Cost per day at sea (dollars per day) for this ship type (values of 0 to 99999)
33-40	F8.0	CSTPRT	Cost per day at port (dollars per day) for this ship type (values of 0 to 99999)
41-48	F8.0	DRAFT	Ship draft. This value (0 to 99) is used by the model to determine whether a ship of this type may enter the port, except for itinerary ships. The user must make sure that all ports on the itinerary have acceptable draft for any ship assigned to the itinerary.

COLS	FORMAT	NAME	DESCRIPTION
49-56	F8.0	ADJTRN	Multi-transfer system adjustment factor. This value is used to reflect the interference of cargo transfer systems operating simultaneously. The productivity rate for each transfer system is multiplied by this factor. A value of "1" indicates that transfer systems operate together at the same rate that they operate independently. A value from 0 through 99999 will result in a lower rate then the base productivity rate.
57	Blank	-	-
58	I1	KTRANS	Cargo transfer system type 6 (Nonself-sustaining container)
59	I1	-	Cargo transfer system type 5 (Not used)
60	I1	-	Cargo transfer system type 4 (RoRo)
61	I1	-	Cargo transfer system type 3 (Lighterage)
62	I1	-	Cargo transfer system type 2 (Self-sustaining container)
63	I1	-	Cargo transfer system type 1 (Break bulk). A "1" in any of the above columns indicates the use of that transfer system. A "0" indicates that the transfer system is not used.
64	I1	-	Number of different transfer systems used (values of 0 to 6)
65-72	8I1	KARSHP	Types of cargo this ship may carry. Start in Col. 65 with the least preferred type and proceed to Col. 72 with the most preferred.

COLS	FORMAT	NAME	DESCRIPTION
73	I1	KPREFI	First berth type preference (if any) for this ship type (values 0 to 6). A value of 0 indicates that the ship has no facility preference and will enter the berths at the port giving the highest productivity rate.
74	I1	KPREF2	Second berth type preference (if any) for this ship type. If all the berths of first preference are occupied, the ship will attempt to enter this type.
75	I1	KCHANG	Changes in theaters a ship of this type can make when being removed from the pool. 0--ship can change both home and delivery theaters 1--ship can change only delivery theaters 2--ship can change neither theater
76-80	A	"ST#"	Card name, ST1 for first ship type card, ST2 for second, etc.

5.16 SHIP IDENTIFICATION

These cards contain initial ship information. Each card contains information for four ships.

COLS	FORMAT	NAME	DESCRIPTION
1- 3	I3	ISHIP(1)	Time of availability (in days). This is the time at which a ship initially enters the game. Any value from 0 to 319 days may be chosen. If the value entered in these columns is 320, the ship is placed in the ship pool, where it remains for at least 30 days or until cargo movement requirements warrant its removal.
4- 5	I2	-	Initial port number. The first port of call for the ship at the beginning of the game. If the ship is on an itinerary, the initial port must be a port on the itinerary. If the ship is nonitinerary, the initial port must be a port within the home theater.
6- 7	I2	-	Itinerary number (if any). This input (with a value of 1 to 10) is required if the ship is assigned to itinerary operations. A 0 is input if the ship is nonitinerary.
8	I1	-	Type of operation. Enter 1 for intertheater operations 2 for intratheater operations 0 for nonitinerary operations
9	I1	-	Owner. Identifies the contractual control of the ship (values of 1 to 6)

COLS	FORMAT	NAME	DESCRIPTION
10-11	I2	-	Ship type. One of the 25 possible ship types. The ship will have all the characteristics of that ship type as input on the ship type (ST) card.
12-14	-	ISHIP2	Blank
15	I1	-	Delivery Theater Number. Establishes the delivery theater of an inter-theater ship (a number from 1 through 6). Not applicable for ships assigned an itinerary (a zero is input). For intratheater ships, the delivery theater and home theater will be identical.
16-17	I2	-	Home Port. Establishes the home theater of intra-theater and intertheater ships; e.g., if the port input is in theater 1, then theater 1 will be the home theater of this ship. Not applicable for ships assigned to itinerary operations.
18-28	-	-	Same type of information shown in card columns 1-11, for a second ship.
29-34	-	-	Same type of information shown in card columns 12-17, for a second ship.
35-45	-	-	Same type of information shown in card columns 1-11, for a third ship.
46-51	-	-	Same type of information shown in card columns 12-17, for a third ship.
52-62	-	-	Same type of information shown in card columns 1-11, for a fourth ship.
63-68	-	-	Same type of information shown in card columns 12-17, for a fourth ship.

COLS	FORMAT	NAME	DESCRIPTION
69-72	-	-	Blank
73-80	A	Ship#	The sequence number included in the card name will be used to maintain cards in proper order. The number given to each ship by the model is dependent on the order in which cards are input, e.g., card "SHIP 1" will identify ship #1, ship #2, ship #3, and ship #4. Card "SHIP 2" will identify ship #5, ship #6, etc.

5.17 MANIPULATION

These four cards allow a user to vary ships used in the game by type and availability without changing ST cards or SHIP cards.

CARD	COLS	FORMAT	NAME	DESCRIPTION
1	1-3	I3	MANIP 1	Number (less than or equal to NTYPE) of ship types required
2	1-2	I2	MANIP 2	Ship types used (value corresponds to value of ST)
	3-4			
	5-6			
	•			
	•			
	•			
3	1-3	I3	MANIP 3	Highest acceptable availability of ships*
4	1-3	I3	MANIP 4	Number subtracted from availability*

*NOTE: All ships of owner type 2 (MSC shipping) will remain in the game, and no change will be made to their availability.

APPENDIX A

GENERAL DESCRIPTION OF REACT II*

*This information was excerpted from Perry, Howard W. and Catherine B. Gleason, "REACT--A Shipping Operations Simulation," Research Associates Incorporated, Silver Spring, Md. (Jan 1969).

I. INTRODUCTION

REACT, an acronym for Requirements Evaluated Against Cargo Transportation, is a computer simulation model developed for use in the study and analysis of shipping operations. The model was designed to be general enough to allow a wide spectrum of shipping operations to be analyzed.

Consider a system consisting of certain objective areas at which cargo is to be delivered. This cargo is available at certain sources. The general problem then is to transport this cargo from these sources to the required destinations using the ship inventory that is available.

REACT allows for the simulation of this shipping operation in which the sources, objective areas, and ship inventory are defined in general terms. That is, the quantity and characteristics of each of these elements are functions of the input data. It follows, therefore, that with this degree of flexibility the model can simulate a wide variety of system configurations.

The following sections describe in some detail the operation of the model with regard to the overall task of transporting cargo from one port to another.

II. SHIP OPERATION

The flexibility of the model allows the simulation of different modes of ship operation. Both itinerary and nonitinerary ships may be simulated. An itinerary is defined in the model as an ordered set of ports. Provision is made in the model for the inclusion of up to ten different itineraries, each of which may comprise up to ten ports. Thus, operations of an itinerary ship are restricted to the ports on its itinerary, while ships not assigned to an itinerary operate in response to cargo delivery requirements. Nonitinerary ships, however, must be assigned to either intra- or intertheater operations, in order to maintain some control over their activities. Intratheater ships respond only to cargo generated for delivery within the same theater, whereas intertheater ships are allowed to operate between and within two separate theaters. Ships referred to as intertheater ships may, in some cases operate as intratheater ships, depending on the cargo they carry.

III. SHIP POOL

Provision is made in the model for a pool of ships. Ships enter the pool for one of two reasons. The first is that the ships may have been input initially as being in the pool. This feature may be useful in representing, for example, the availability of the reserve fleet on some delayed basis. The second reason is that the ships may have been on normal operation previously and then entered the pool at some later time because there was no cargo to be delivered which they were eligible to carry. Ships entering the pool for this second reason must remain in the pool for a time period specified in the input before they may leave. This time represents ROS (reduced operating status) incurred when a ship is removed from cargo activity after returning to its home port and not finding any cargo to be delivered.

IV. CARGO GENERATION

Rather than directly addressing the cargo requirements existing at the various ports, the model concerns itself with the generation of cargo at certain ports for delivery to those ports which require the cargo. This approach may be considered equivalent since any requirement must ultimately be fulfilled by the generation of the specific cargo. This approach also avoids the necessity of modeling the interface between the requesting activity and that activity charged with transporting the cargo to a port area. Thus, in order to simulate cargo requirements in the model, cargo requirements at a given time must be translated into cargo generated at an earlier time to allow for the pick-up and delivery of the cargo to the required objective port. Cargo requirements are converted to generations in the following manner:

After the requirements for a particular cargo type at the given objective area have been examined, historical data can supply information concerning the ports that have fulfilled that requirement in the past and the corresponding ratios in which the commodity was supplied. The historical data can also be examined to determine the distribution of shipment amounts for these port pairs (origin-destination). With this information, the number of generations needed to provide the required cargo can be computed.

Since the sealift requirements are given on a time-phased basis, the generations must be scheduled such that the requisite amount of cargo is generated in time to meet the requirements. With this estimate as to the available time in which to generate the cargo and knowing, from the above computations, the number of generations needed, the frequency of generation can be computed. Thus, the information needed for each generation (the frequency and the distribution of cargo amounts) may be synthesized from the sealift requirements.

Hence, cargo is introduced to the model in the form of "cargo generations." A cargo generation may be defined as "generation, at a specific time, of a determined amount of a particular type of cargo at a port for delivery to some other port." Thus, cargo in the game is generated for delivery on an input time-phased schedule in amounts needed to meet the proposed requirements. The input factors which control the schedule and the amount of cargo for each generation include: (1) the frequency of generation, (2) time of initial generation, and (3) the statistical distribution required to generate cargo.

The input time of initial generation serves only to fix the time of first occurrence of a particular generation. If this input is properly chosen for all cargo generations, initialization effects in the model can be reduced to a minimum. Following the initial occurrence, cargo generation recurs on a cyclic basis where the cycle time is equal to the input frequency of generation.

When the time for a generation is reached, the statistical distribution type of the generation must be determined. The amount of cargo generated is then computed as a random variate from the distribution type, using the input parameters of the distribution. The generated cargo is then added to the system and tagged as cargo to be delivered.

An additional feature of the cargo generation package in the model is the capability to change the frequency of any cargo generation once during the play of the game. To accomplish this requires only input of the new frequency and the time at which the new frequency becomes effective. When that time is reached, the new frequency is utilized to

determine all subsequent occurrences of that particular generation. This feature can simulate the heavy delivery requirements in the initial stages of a contingency and the subsequent reduction in requirements once the necessary inventory levels are established.

V. CARGO HANDLING RATES

The rate at which cargo is loaded on or discharged from a ship is a function of several variables. In this model the base rate in measurement tons per day is input as the average rate at which cargo is discharged. It is a function of (1) the cargo type being discharged, (2) the type of transfer system(s) aboard the ship engaged in the operation, and (3) the type of facility at which the ship is berthed or anchored.

Provision is made in the model for a ship type to have multiple transfer systems. This gives the capability of simulating the newer multi-purpose ships. In considering cargo operations aboard the multi-transfer system ships, the model makes the assumption that each transfer system may operate simultaneously on each cargo block that is to be moved. The overall rate using the available transfer systems is then adjusted by an input factor. This factor is used to account for mutual interference of the transfer systems. This approach is not exactly equivalent to the real life situation in which each transfer system operates on different cargo blocks simultaneously. It does not preclude, however, obtaining realistic port times for the multi-purpose ships if the values of the associated inputs are judiciously chosen.

APPENDIX B

SAMPLE OUTPUT

PRODUCTIVITY RATES BASED ON CARGO TYPE, TRANSFER SYSTEM AND FACILITY TYPE

1797.	3663.	7138.	1085.	2500.	781.	0.	0.
9651.	0.	31329.	5827.	5000.	4195.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
8374.	17069.	27181.	5055.	5000.	3628.	0.	10288.
5787.	13159.	19445.	3446.	3500.	2481.	7746.	6532.
0.	0.	0.	0.	0.	0.	0.	0.
1797.	3663.	7138.	1085.	2500.	781.	0.	0.
11588.	0.	37591.	6991.	5000.	5033.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
8374.	17069.	27181.	5055.	5000.	3638.	0.	10288.
5787.	13159.	19445.	3446.	3500.	2480.	7746.	6532.
0.	0.	0.	0.	0.	0.	0.	0.
847.	720.	3349.	513.	1000.	369.	1036.	1196.
0.	0.	0.	0.	0.	0.	0.	0.
22963.	46818.	74542.	13866.	5000.	9980.	30395.	13889.
0.	0.	0.	0.	0.	0.	0.	0.
2696.	6287.	9129.	1828.	1000.	1172.	3664.	2362.
0.	0.	0.	0.	0.	0.	0.	0.
1797.	3663.	7138.	1085.	2500.	781.	0.	0.
9651.	0.	31329.	5827.	5000.	4195.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
18467.	21336.	33976.	6319.	625.	4549.	0.	12868.
5787.	13159.	19445.	3446.	3500.	2481.	7746.	6532.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
1797.	3663.	7138.	1085.	2500.	781.	0.	0.
11588.	0.	37591.	6991.	5000.	5033.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
8374.	17069.	27181.	5055.	5000.	3638.	0.	10288.
5787.	13159.	19445.	3446.	3500.	2480.	7746.	6532.
11588.	0.	37591.	5827.	5000.	4195.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.

DISTANCE MATRIX FOR 30 PORTS

0.	125.	325.	280.	468.	550.	3440.	3218.	3114.	4871.
4692.	1399.	1093.	3643.	12012.	1721.	4068.	5490.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
125.	0.	300.	170.	438.	520.	3578.	3356.	3255.	4218.
4831.	1395.	1254.	3781.	4986.	1692.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
325.	300.	0.	123.	385.	475.	3714.	3492.	3388.	4345.
4966.	4966.	4966.	3917.	12286.	1639.	3743.	5764.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
280.	170.	123.	0.	262.	350.	3591.	3369.	3266.	4223.
4844.	4844.	4844.	3794.	12164.	1521.	3686.	5642.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
468.	430.	385.	262.	0.	180.	3783.	3561.	3454.	4411.
4832.	4832.	4832.	3986.	12152.	1259.	3688.	5630.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
550.	520.	457.	350.	180.	0.	3852.	3630.	3523.	4480.
5181.	5105.	5105.	4055.	12421.	1379.	3818.	5899.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3440.	3578.	3714.	3591.	3783.	3852.	0.	261.	1329.	1885.
2870.	3844.	2258.	256.	3029.	4850.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3218.	3356.	3492.	3369.	3561.	3630.	261.	0.	1071.	2028.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3114.	3253.	3388.	3266.	[illegible]54.	3523.	1329.	1071.	0.	957.
1578.	3266.	2112.	1532.	[illegible]37.	4478.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4071.	4210.	4345.	4223.	4411.	4480.	1805.	2028.	957.	0.
986.	4223.	3069.	2452.	1066.	5420.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4692.	4831.	4966.	4844.	4832.	5101.	2870.	2649.	1578.	986.
0.	0.	0.	3873.	210.	6041.	9600.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4692.	4831.	4966.	4844.	4832.	5101.	2870.	2649.	1578.	986.
0.	0.	0.	3873.	210.	6041.	9600.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4692.	4831.	4966.	4844.	4832.	5101.	2870.	2649.	1578.	986.
[illegible]	0.	0.	3873.	210.	6041.	9600.	0.	0.	0.
[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.
3643.	3781.	3917.	3794.	3986.	4055.	256.	464.	1532.	2452.
3873.	4057.	2461.	0.	2323.	5053.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12012.	4986.	12286.	12164.	12152.	12421.	3029.	2408.	1734.	1058.
218.	5803.	3849.	3232.	0.	6200.	11526.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1721.	1692.	1639.	1521.	1259.	1379.	4850.	4628.	4478.	5420.
6041.	1541.	2652.	5053.	6200.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4868.	0.	3747.	3686.	3608.	3518.	0.	0.	0.	0.
9600.	9600.	9600.	0.	11526.	0.	0.	18398.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5498.	0.	5764.	5642.	5630.	5899.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	18398.	0.	0.	0.

```
INTERTHEATER CYCLE TIMES (DAYS)
 0 50 56  0  0  0    0  0  0  0  0  0    0  0  0  0  0  0    0  0  0  0  0  0    0  0  0  0  0  0    0  0  0  0  0  0

CONVERSION FACTORS FOR EACH CARGO TYPE (MT/LT)
     2.60      5.30      7.10      1.57      60.13      1.13      3.44      5.14

COST ($/MT) FOR COMMERCIALLY CARRIED CARGO BY TYPE
    12.53     12.15      9.55     12.91       7.49     22.93      8.33      1.25

LOAD ADJUSTMENT FACTOR    1.00
TRANSIT TIME TO OR FROM SHIP POOL    1.00
ACCEPTABLE PERCENTAGE OF HIGHEST AVAILABLE PRODUCTIVITY RATE      .50
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G E N E R A L   I N P U T S

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 DATA IDENTIF+CATION IS   PIRAEUS WITH MOD 2 SRP AND MOD CARGEN

 NUMBER OF SHIP TYPFS IN GAME        =     25
 NUMBER OF SHIPS IN GAME             =    145
 NUMBER OF THEATRES IN GAME          =      1
 NUMBER OF PORTS IN GAME             =     18
 NUMRER OF FACILITY TYPES IN GAME    =      6
 NUMBER OF ITINERARIES IN GAME       =      8

 TIME INTERVAL BETWEEN PERIODIC SYSTEM STATUS PRINTOUT (IN DAYS)  IS      5.

 TIME FOR MAXIMUM LENGTH OF PLAY IN DAYS  IS     30.

  FIRST SYSTEM STATUS PRINTOUT(+N DAYS) IS AT      5.

 DIFFERENTIAL   COST  FOR OWNER TYPE   1   BERTH LINER   IS       0.00  DOLLARS/DAY
 DIFFERENTIAL   COST  FOR OWNER TYPE   2   MSTS CONTRL   IS       0.00  DOLLARS/DAY
 DIFFERENTIAL   COST  FOR OWNER TYPE   3   GAA           IS     125.00  DOLLARS/DAY
 DIFFERENTIAL   COST  FOR OWNER TYPE   4   REQ / NAT.    IS     740.00  DOLLARS/DAY
 DIFFERENTIAL   COST  FOR OWNER TYPE   5   S/S CONTNR    IS    -440.00  DOLLARS/DAY
 DIFFERENTIAL   COST  FOR OWNER TYPE   6   N/S/S CONTNR  IS    -440.00  DOLLARS/DAY
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...P O R T I N F O R M A T I O N

	PORT	THEATRE OF PORT	PORT DELAY TIME (DAYS)	ADJUST FOR PRODUC RATE	CARGO HANDLE CST/DA ($)	MAX. DRAFT (FT)	NO. FACILITIES AVAILABLE (BY TYPE) 1	2	3	4	5	6
1	NEW YORK	1	.5	3.000	28964.	45.	142	0	116	1	0	5
2	PHILADELPHIA	1	.5	3.000	1617A$_2$	33.	77	0	0	1	0	6
3	BALTIMORE	1	.5	3.000	11861.	40.	52	1	12	1	0	5
4	NORFOLK	1	.3	3.000	13924.	40.	20	1	100	1	0	6
5	SUNNY POINT	1	.5	3.000	48593.	38.	10	1	0	0	0	1
6	CHARLESTON	1	.5	3.000	1135A.	35.	13	1	5	0	0	0
7	ROTTERDAM	2	.4	3.000	4163.	39.	50	10	44	1	0	10
8	SOUTHAMPTON	2	.3	3.000	6625.	35.	150	0	4	4	0	6
9	ROTA	3	.3	3.000	151A.	33.	21	0	0	0	0	1
10	LEGHORN	3	.3	3.000	7100.	30.	50	0	80	0	0	4
11	PIRAEUS	3	.3	3.000	0.	40.	10	0	20	1	0	4
12	PIRAEUS	3	.3	3.000	0.	40.	10	0	20	1	0	4
13	PIRAEUS	3	.3	3.000	0.	40.	10	0	20	1	0	4
14	AMSTERDAM	2	.5	3.000	6365.	36.	200	10	17	2	0	10
15	PERSIAN GULF	3	.5	3.000	99999.	36.	10	1	10	1	0	2
16	NEW ORLEANS	1	.6	3.000	15987.	36.	61	0	61	0	0	2
17	S.CAL	1	.5	3.000	0.	36.	150	1	10	1	0	4
18	ISRAEL	3	.5	3.000	0.	45.	30	4	5	1	0	12

...SHIP TYPE INFORMATION

SHIP TYPE	SPEED (KTS)	CARGO WT (LT)	CARGO VOL (MT)	COST AT SEA ($/DA)	COST IN PORT ($/DA)	SHIP DRAFT (FT)	MULTI TRANS ADJUST FACTOR	NO. TRANS SYST	BY TYPE 1 2 3 4 5 6 (0=NO,1=YES)	CARGO TYPES	FACILITY PREFERENCE		TNTR CHNG
1	19.0	7285.	18391.	21780.	11480.	38.	1.000	1	1 0 0 0 0 0	1 4 3 0 0	1	3	BOTH
2	21.0	15219.	27855.	21780.	11480.	35.	1.000	1	1 0 0 0 0 0	6 0 0 0 0	1	3	BOTH
3	80.0	1980.	5000.	0.	0.	32.	1.000	1	0 0 0 0 0 1	1 5 5 4 3	6	1	BOTH
4	20.0	5815.	14624.	27780.	13000.	32.	1.000	1	0 0 0 0 0 1	4 1 3 0 0	6	0	BOTH
5	21.0	13500.	25344.	27780.	13000.	32.	1.000	1	0 0 0 0 0 1	1 4 3 0 0	6	0	BOTH
6	23.0	9430.	34112.	27780.	13000.	31.	1.000	1	0 0 0 0 0 1	4 1 0 0 0	6	0	BOTH
7	22.0	28470.	43300.	45900.	30780.	37.	1.000	1	0 0 1 0 0 0	1 4 0 0 0	3	0	BOTH
8	23.0	16789.	41415.	45900.	30780.	35.	1.000	1	0 0 1 0 0 0	1 4 0 0 0	3	0	BOTH
9	20.0	9830.	13643.	21780.	11480.	32.	1.000	1	1 0 0 0 0 0	6 0 0 0 0	1	3	BOTH
10	19.0	4850.	12000.	27780.	13000.	33.	1.000	1	0 0 0 0 0 1	1 4 0 0 0	6	0	BOTH
11	20.0	8720.	18747.	21780.	11480.	33.	1.000	1	1 0 0 0 0 0	1 4 3 0 0	1	3	BOTH
12	20.0	7300.	5600.	27780.	13000.	29.	1.000	1	0 0 0 0 0 1	1 4 0 0 0	6	0	BOTH
13	20.0	10973.	18976.	21780.	11480.	30.	1.000	1	1 0 0 0 0 0	4 1 3 0 0	1	3	BOTH
14	16.0	7500.	26284.	27780.	13000.	29.	1.000	1	0 0 0 0 0 1	1 4 0 0 0	6	0	BOTH
15	17.0	6300.	32760.	27780.	13000.	29.	1.000	1	0 0 0 0 0 1	1 4 0 0 0	6	0	BOTH
16	17.0	7827.	14381.	21780.	11480.	30.	1.000	1	1 0 0 0 0 0	1 4 3 0 0	1	0	BOTH
17	20.0	10456.	29760.	27780.	13035.	31.	1.000	1	0 0 0 0 0 1	1 4 3 0 0	6	0	BOTH
18	16.0	4890.	13680.	27780.	13000.	28.	1.000	1	0 0 0 0 0 1	6 0 0 0 0	6	0	BOTH
19	17.0	10659.	37600.	27700.	13000.	30.	1.000	1	0 0 0 0 0 1	6 0 0 0 0	6	0	BOTH
20	24.0	17000.	44320.	27780.	13000.	34.	1.000	1	0 0 0 0 0 1	1 4 0 0 0	6	0	BOTH
21	33.0	24435.	54176.	27780.	13000.	34.	1.000	1	0 0 0 0 0 1	4 1 0 0 0	6	0	BOTH
22	18.0	8850.	13519.	21780.	11480.	30.	1.000	1	1 0 0 0 0 0	6 0 0 0 0	1	3	BOTH
23	20.0	7565.	16072.	21780.	11480.	30.	1.000	1	1 0 0 0 0 0	1 4 0 0 0	1	3	BOTH
24	24.0	13866.	34314.	34300.	16520.	34.	1.000	1	0 0 0 1 0 0	3 0 0 0 0	4	1	BOTH
25	19.0	8645.	15287.	34300.	16520.	30.	1.000	1	0 0 0 1 0 0	3 0 0 0 0	4	1	BOTH

. . . C A R G O G E N E R A T E D

NO.	TYPE	ORIGIN PORT	DESTIN PORT	AMOUNT	FIRST DAY	FREQ	CHANGE FREQ	NEW FREQ	LAST DAY
1	1	3	11	12510	1	0	0	0	1
2	1	3	11	11570	1	0	0	0	1
3	3	3	11	46803	1	0	0	0	1
4	3	3	11	67825	1	0	0	0	1
5	4	3	11	48660	1	0	0	0	1
6	1	3	12	2885	26	10	0	0	136
7	1	3	12	5888	26	10	0	0	136
8	4	3	12	12982	26	10	0	0	136
9	4	3	12	11220	26	10	0	0	136
10	1	3	13	18695	32	0	0	0	32
11	3	3	13	75366	32	0	0	0	32
12	3	3	13	75367	32	0	0	0	32
13	3	3	13	75367	32	0	0	0	32
14	1	4	11	36315	1	0	0	0	1
15	1	4	11	34888	1	0	0	0	1
16	3	4	11	46803	1	0	0	0	1
17	3	4	11	67826	1	0	0	0	1
18	4	4	11	58490	1	0	0	0	1
19	1	4	12	10450	26	10	0	0	136
20	1	4	12	2885	26	10	0	0	136
21	1	4	12	14240	57	10	0	0	137
22	4	4	12	14648	57	10	0	0	137
23	4	4	12	12982	26	10	0	0	136
24	4	4	12	8110	26	10	0	0	136
25	1	4	13	85440	32	0	0	0	32
26	4	4	13	58080	32	0	0	0	32
27	6	5	11	185	1	0	0	0	1
28	6	5	11	423	1	0	0	0	1
29	6	5	11	423	1	0	0	0	1
30	6	5	11	784	1	0	0	0	1
31	6	5	11	28020	1	0	0	0	1
32	6	5	11	28020	1	0	0	0	1
33	6	5	11	26460	1	0	0	0	1
34	6	5	12	4128	57	10	0	0	137
35	6	5	12	130	26	10	0	0	136
36	6	11	7	24720	32	0	0	0	32
37	6	11	8	24720	32	0	0	0	32
38	6	11	14	24720	32	0	0	0	32
39	4	12	2	12982	26	10	0	0	136
40	4	12	3	12982	26	10	0	0	136
41	4	12	5	12982	26	10	0	0	136
42	4	13	6	12982	26	10	0	0	136
43	1	17	11	12510	1	0	0	0	1
44	1	17	11	14567	1	0	0	0	1
45	4	17	11	77498	1	0	0	0	1

SHIP INITIALIZATION VALUES

SHIP NO.	SHIP OWNR	SHIP TYPE	SHIP ITINERARY	DELIVERY THEATRE	HOME PORT	INITIAL PORT	TIME AVAIL	OPERATIONAL TYPE
1	3	3	0	3	4	14	320	INTER
2	3	3	0	3	4	4	320	INTER
3	3	3	0	3	4	4	7	INTER
4	3	3	0	3	4	4	7	INTER
5	3	3	0	3	4	4	7	INTER
6	3	3	0	3	4	4	7	INTER
7	3	3	0	3	4	4	7	INTER
8	3	3	0	3	4	4	7	INTER
9	3	3	0	3	4	3	7	INTER
10	3	3	0	3	4	4	7	INTER
11	3	3	0	3	4	4	7	INTER
12	3	3	0	3	4	4	7	INTER
13	1	1	0	3	4	4	200	INTER
14	1	1	0	3	5	5	200	INTER
15	1	1	0	3	4	4	200	INTER
16	1	1	0	3	4	4	200	INTER
17	1	1	0	3	17	17	24	INTER
18	1	1	0	3	17	17	24	INTER
19	1	1	0	3	17	17	28	INTER
20	1	1	0	3	17	17	200	INTER
21	1	1	0	3	17	17	200	INTER
22	1	1	0	3	17	17	200	INTER
23	1	1	0	3	17	17	200	INTER
24	1	1	0	3	17	17	200	INTER
25	1	1	0	3	4	4	30	INTER
26	1	1	0	3	4	4	200	INTER
27	1	1	0	3	5	5	200	INTER
28	1	2	0	3	17	17	28	INTER
29	1	2	0	3	17	17	200	INTER
30	1	2	0	3	17	17	200	INTER
31	1	17	0	3	17	17	200	INTER
32	5	4	0	3	17	17	30	INTER
33	5	4	0	3	17	17	200	INTER
34	5	5	0	3	17	17	28	INTER
35	5	5	0	3	17	17	200	INTER
36	1	5	0	3	17	17	200	INTER
37	1	6	0	3	17	17	200	INTER
38	1	6	0	3	17	17	200	INTER
39	1	7	0	3	5	5	200	INTER
40	1	7	0	3	4	4	200	INTER
41	1	7	0	3	17	17	200	INTER
42	1	7	0	3	17	17	200	INTER
43	1	7	0	3	17	17	200	INTER
44	1	7	0	3	17	17	200	INTER
45	1	8	0	3	17	17	200	INTER
46	1	8	0	3	17	17	200	INTER
47	1	8	0	3	4	4	200	INTER
48	1	8	0	3	4	4	200	INTER
49	1	8	0	3	17	17	200	INTER
50	1	9	0	3	17	17	200	INTER
51	1	9	0	3	17	17	200	INTER
52	1	10	0	3	17	17	200	INTER
53	1	10	0	3	17	17	200	INTER
54	1	11	0	3	17	17	10	INTER
55	1	11	0	3	17	17	14	INTER
56	1	11	0	3	17	17	20	INTER

S Y S T E M S T A T U S A T 5.0 D A Y S

CUMULATIVE SYSTEM COST = 0.000 (MIL $) CURRENT NUMBER OF SHIPS IN POOL = 2

P O R T I N F O R M A T I O N

CARGO DELIVERED TO PORT 3 BALTIMORE BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REQ / NAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
M/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 3 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
24888	0	114628	48668	0	0	0	0	187368

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 3 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	0	0	0	0

NUMBER OF SHIPS THAT HAVE USED PORT 3 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

NUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 3 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 3 = 0.0 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO DELIVERED TO PORT 4 NORFOLK BY TYPE (MT)

OWNER	CARGO Type 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REQ / NAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 4 BY TYPE (KT)

1	2	3	4	5	6	7	8	TOTAL
71115	0	114629	50490	0	0	0	0	236234

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 4 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	0	0	0	0

NUMBER OF SHIPS THAT HAVE USED PORT 4 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

NUMBER OF SHIPS (INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 4 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 4 = 8.9 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 8.8 DAYS

CARGO DELIVERED TO PORT 5 SUNNY POINT BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REQ / MAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 5 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	84231	0	0	84231

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 5 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	0	0	0	0

NUMBER OF SHIPS THAT HAVE USED PORT 5 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

NUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 5 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 5 = 0.0 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO DELIVERED TO PORT 17 S.CAL BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REQ / NAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 17 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
27877	0	0	77090	0	0	0	0	104967

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 17 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	0	0	0	0

NUMBER OF SHIPS THAT HAVE USED PORT 17 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

NUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 17 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 17 = 0.0 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO TOTALS
TOTAL AMOUNT OF CARGO GENERATED = 612888
TOTAL AMOUNT OF CARGO SHIPPED = 0
TOTAL AMOUNT OF CARGO DELIVERED = 0

INTERMEDIATE OUTPUT HAS BEEN REMOVED

AT 38.0 DAYS, THE GAME ENDED

SYSTEM STATUS AT 38.0 DAYS

CUMULATIVE SYSTEM COST =******** (MIL $) CURRENT NUMBER OF SHIPS IN POOL = 3

PORT INFORMATION

CARGO DELIVERED TO PORT 3 BALTIMORE BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REQ / MAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 3 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
31965	0	114628	72862	0	0	0	0	219455

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 3 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
24879	0	98946	0	0	0	0	0	123825

NUMBER OF SHIPS THAT HAVE USED PORT 3 BY FACILITY TYPE

1	2	3	4	5	6
1	0	0	3	0	2

NUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 3 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 3 = 0.0 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO DELIVERED TO PORT 4 NORFOLK BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REQ / NAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 4 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
83650	0	114629	71582	0	0	0	0	269861

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 4 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
71114	0	114627	18108	0	0	0	0	283849

NUMBER OF SHIPS THAT HAVE USED PORT 4 BY FACILITY TYPE

1	2	3	4	5	6
17	0	0	1	0	33

NUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 4 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 4 = 0.0 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO DELIVERED TO PORT 5 SUNNY POINT BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	T
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REG / NAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 5 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	84361	0	0	84361

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 5 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	15525	0	0	15525

NUMBER OF SHIPS THAT HAVE USED PORT 5 BY FACILITY TYPE

1	2	3	4	5	6
5	0	0	0	0	1

NUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 5 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 5 = 16.7 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO DELIVERED TO PORT 11 PIRAEUS BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	11448	0	27453	0	0	0	0	0	38893
MSTS CONTRL	12857	0	27454	0	0	10000	0	0	50311
GAA	63674	0	96324	0	0	0	0	0	159998
REC / MAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	87971	0	151231	0	0	10000	0	0	249202

TOTAL AMOUNT OF CARGO GENERATED AT PORT 11 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 11 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
0	0	0	0	0	0	0	0	0

NUMBER OF SHIPS THAT HAVE USED PORT 11 BY FACILITY TYPE

1	2	3	4	5	6
25	0	0	2	0	17

NUMBER OF SHIPS (INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 11 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 11 = 0.0 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO DELIVERED TO PORT 17 S.CAL BY TYPE (MT)

OWNER	CARGO TYPE 1	2	3	4	5	6	7	8	TOTAL
BERTH LINER	0	0	0	0	0	0	0	0	0
MSTS CONTRL	0	0	0	0	0	0	0	0	0
GAA	0	0	0	0	0	0	0	0	0
REQ / NAT.	0	0	0	0	0	0	0	0	0
S/S CONTNR	0	0	0	0	0	0	0	0	0
N/S/S CONTNR	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

TOTAL AMOUNT OF CARGO GENERATED AT PORT 17 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
27877	0	0	77890	0	0	0	0	105767

TOTAL AMOUNT OF CARGO SHIPPED FROM PORT 17 BY TYPE (MT)

1	2	3	4	5	6	7	8	TOTAL
27876	0	0	77888	0	0	0	0	104964

NUMBER OF SHIPS THAT HAVE USED PORT 17 BY FACILITY TYPE

1	2	3	4	5	6
17	0	0	6	0	2

NUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENTLY AT PORT 17 BY FACILITY TYPE

1	2	3	4	5	6
0	0	0	0	0	0

PERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE AT PORT 17 = 0.0 PER CENT
MEAN WAITING TIME OF THESE SHIPS = 0.0 DAYS

CARGO TOTALS
TOTAL AMOUNT OF CARGO GENERATED = 738577
TOTAL AMOUNT OF CARGO SHIPPED = 447363
TOTAL AMOUNT OF CARGO DELIVERED = 249282

PER CENT OF SHIP VOLUME USED BY NON-ITINERARY SHIPS LEAVING HOME THEATER

SHIP TYPE	1	USED VOLUME	61.5
SHIP TYPE	3	USED VOLUME	78.3
SHIP TYPE	11	USED VOLUME	76.3
SHIP TYPE	12	USED VOLUME	80.0
SHIP TYPE	14	USED VOLUME	44.8
SHIP TYPE	16	USED VOLUME	51.7
SHIP TYPE	17	USED VOLUME	80.8
SHIP TYPE	18	USED VOLUME	48.6
SHIP TYPE	22	USED VOLUME	74.8
SHIP TYPE	23	USED VOLUME	75.4
SHIP TYPE	24	USED VOLUME	80.0

PER CENT OF SHIP VOLUME USED BY NON-ITINERARY SHIPS LEAVING HOME THEATER

	DESTINATION THEATER					
ORIGIN THEATER	1	2	3	4	5	6
1	0.0					

PER CENT OF SHIP VOLUME USED BY NON-ITINERARY SHIPS LEAVING HOME THEATER

= 74.0

CARGO NOT YET SHIPPED

GEN. NO.	AMOUNT	GEN. NO.	AMOUNT	GEN. NO.	AMOUNT	GEN. NO.	AMOUNT	GEN. NO.	AMOUNT
1	0.	2	0.	3	0.	4	15679.	5	48668.
6	2885.	7	5808.	8	12982.	9	11228.	10	0.
11	0.	12	0.	13	0.	14	0.	15	0.
16	0.	17	0.	18	32381.	19	10458.	20	2885.
21	0.	22	0.	23	12982.	24	8118.	25	0.
26	0.	27	0.	28	4.	29	0.	30	0.
31	14225.	32	28020.	33	26468.	34	0.	35	130.
36	0.	37	0.	38	0.	39	12982.	40	12982.
41	12982.	42	12982.	43	0.	44	0.	45	0.

TIME	CARGO DELIVERED	SHIPS IN POOL
5	0	2
10	35088	2
15	40888	3
20	187453	2
25	197762	2
30	249282	3

SHIPTYPES IN GAME 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
HIGHEST ACCEPTABLE AVAILABILITY 30
NUMBER SUBTRACTED FROM AVAILABILITY 0

APPENDIX C

PROGRAM LISTING

```
*DECK REACT1
      PROGRAM REACT(INPUT, OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT, PUNCH)
      CALL MAIN
      STOP
      END
```

```
*DECK CARGFN1
      SUBROUTINE CARGEN
      COMMON
     1 NSTYPE,NNPORT,NFTYPE,NTHEA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(410),NEVENT, IVENT,LVENT1,LVENT2,LVENT3,INSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NFPRT1(30),NFPPT2(30),ITHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPPT(30),TTRAN,KFPRT1(30),KFPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLO,
     3 ADJCGO(8)
      COMMON
     1 KARGDL(30,8,6),NQPORT(30),NPRFAC(30,6),KRGSHP(30,8),TQPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      DO 100 I=1,NKGOGN
      ITIME=TIME
      IF (ITIME.GT.KGOGN1(I)/100000000000)GOTO100
      IF (MOD(KGOGN1(I)/100000000,1000 ).GT.ITIME) GO TO 90
      KGOGN1(I)=KGOGN1(I)+100000000
      INIT=MOD(KGOGN1(I)/100000000,1000 )
      IVAL=MOD(KGOGN1(I)/1000000,100)
      IF(INIT.LT.IVAL) GO TO 90
        IDISTR=MOD(KGOGN1(I)/100000,10)+1
      PAR1=MOD(KGOGN2(I),100000)
      PAR2=KGOGN2(I)/100000
      KGOGN1(I)=(KGOGN1(I)/100000000000)*100000000000+MOD(KGOGN1(I)
     1,100000000)
      GO TO (10,20,30,40),IDISTR
10    KGOGN2(I)=0
20    XMT=PAR1
      GOTO 80
30    CALL RNG
      XMT=ABS(PAR2+RN*(PAR1-PAR2))
      GOTO80
40    PNUM=0
      DO 50 J=1,12
      CALL RNG
50    RNUM=RN+RNUM
      XMT=PAR2+PAR1*(PNUM-6.)
      IF (XMT.LT.0)XMT=0
80    CGOGN3(I)=CGOGN3(I)+XMT
      ICT=MOD(KGOGN1(I)/10000,10)
      IPT=MOD(KGOGN1(I)/100,100)
      KRGGEN(IPT,ICT)=KRGGEN(IPT,ICT)+IFIX(XMT)
      IF (KGOGN4(I)/100.NE.ITIME)GOTO100
90    IF (KGOGN4(I).LE.0)GOTO100
      KGOGN1(I)=(KGOGN1(I)/100000000000) *100000000000+MOD(KGOGN4(I),
     1100)*1000000+MOD(KGOGN1(I),1000000)
      KGOGN4(I)=0
```

```
100   CONTINUE
      LVENT1=0
      LVENT2=3
      LVENT3=0
      TVENT=TIME *1.
      CALL PUT
      CALL TAKE
      RETURN
      END



*DECK ENDGAM1
      SUBROUTINE ENDGAM
      COMMON
     1 NSTYPE,NNPORT,NETYPE,NTHEA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(410),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NEPRT1(30),NEPRT2(30),ITHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DETPRT(30),TTRAN,KEPRT1(30),KEPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGDL(30,8,6),NQPORT(30),NPRFAC(30,6),KRGSHP(30,8),TQPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      COMMON/C/ KRGD(40),NPOOLM(40),NTSTOP
      COMMON/NN/NNTYPE(25),NCT,NNAVAIL,NNNA
      ISW = 1
      CALL PRINT
      WRITE (6,101) (I,CGOGN3(I),I=1,NKGOGN)
  101 FORMAT(43X,22HCARGO NOT YET SHIPPED /4X,5(8HGEN. NO.,2X,6HAMOUNT,
     14X)/ ( 6X,I3,4X,F8.0,5X,I3,4X,F8.0,5X,I3,4X,F8.0,5X,I3,4X,F8.0,5X,
     2  I3,4X,F8.0, /)  )
        WRITE(6,159)
159     FORMAT(///20X,*TIME      CARGO DELIVERED      SHIPS IN POOL*)
      DO 160 MMM=5,NTSTOP,5
        MM=MMM/5
      WRITE(6,161)MMM,KRGD(MM),NPOOLM(MM)
160     CONTINUE
161     FORMAT(22X,I3,10X,I10,10X,I3)
      WRITE(6,162)(NNTYPE(I),I=1,NCT   )
162   FORMAT(///* SHIPTYPES IN GAME   *,25I3)
      WRITE(6,163)  NNAVAIL,NNNA
 163    FORMAT(* HIGHEST ACCEPTABLE AVAILABILITY      *,I3/* NUMBER SUBTRA
     CCTED FROM AVAILABILITY   *,I3)
        STOP
      END
```

```
*DECK KRGEVL1
      SUBROUTINE KRGEVL
      COMMON
     1 NSTYPE,NNPORT,NFTYPE,NTHEA,MITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(4),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(4100),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACH(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NFPRT1(30),NFPRT2(30),ITHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPRT(30),TTRAN,KFPRT1(30),KFPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4800),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGOL(30,8,6),NQPORT(30),NPRFAC(30,6),KRGSHP(30,8),TQPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      COMMON/FW/NGO,M,K,JJJ
      DIMENSION THRCRG(6,6)
      IF (NPOOL) 90,90,1
    1 DO 100 I = 1,6
      DO 100 J = 1,6
      THRCRG(I,J) = 0.
  100 CONTINUE
      I = 1
    2 IF (CGOGN3(I) )  4,4,3
    3 J = MOD(KGOGN1(I),100)
      K = MOD(KGOGN1(I)/100,100)
      J = ITHPRT(J)
      K = ITHPRT(K)
      THRCRG(K,J) = THRCRG(K,J) + CGOGN3(I)
    4 I = I + 1
      IF (I - NKGOGN)  2,2,400
  400 I= 10. * (TIME + 7.)
      J = NEVENT
  401 IF (MOD(KEVENT(J),10000) - I)       410,410,490
  410 ISAVE = MOD(KEVENT(J)/100000,10)
      IF (ISAVE-1)     420,440,420
  420 IF (ISAVE-2)     430,440,430
  430 J = J-1
      IF (J)     490,490,401
  440 ISAVE = KEVENT(J) / 10000000
      L = MOD(ISHIP2(ISAVE)/100,10)
      K = MOD(ISHIP2(ISAVE),100)
      K = ITHPRT(K)
      LSAVE = MOD(ISHIP(ISAVE),100)
      NSAVE = MOD(ISHIP(ISAVE)/1000000,100)
      IF (ITHPRT(NSAVE) - K)     430,450,430
  450 THRCRG(K,L) = THRCRG(K,L) - .8*CAPACV(LSAVE)
      GO TO 430
  490 KTIME = TIME
       WRITE(6,491) THRCRG(1,3),THRCRG(3,1),THRCRG(3,2),THRCRG(2,3)
```

```
      WRITE(6,492) ISHIP(86),ISHIP2(86)
      NCOUNT=1
800   DO 80 K=1,NSHIP
      ISAVE = ISHIP(K)/100000000
      IF (ISAVE)   80,80,30
 30   IF (KTIME - 320)     31,31,32
 31   IF (KTIME-ISAVE)     80,32,32
 32   L = MOD(ISHIP(K),100)
      GO TO (331,332,333),NCOUNT
331   IGEN=ITHPRT(MOD(ISHIP2(K),100))
      IDEL=MOD(ISHIP2(K)/100,10)
      XMOUNT=0.
      GO TO 4000
332    IF(KCHANG(L)-2)3332,80,80
3332  IGEN=ITHPRT(MOD(ISHIP2(K),100))
      XMOUNT=0.
      GO TO 330
333   IF (KCHANG(L))     33,33,80
33    IGEN=1
330    IDEL=1
4000  IF(THRCRG(IGEN,IDEL)-10000.)70,70,40
40    DO 60 KK=1,NNPORT
      IF(ITHPRT(KK)-IGEN)60,42,60
42    IF(DRAFT(L)-DFTPRT(KK))43,60,60
  43   GO TO (435,435,431),NCOUNT
431   XMOUNT=0.
435   DO 50  LL=1,8
      LLL=LL-1
      JJJ=MOD(KARSHP(L)/10**LLL,10)
      IF(JJJ)50,50,44
44    DO 48 NK=1,NKGOGN
      IF((MOD(KGOGN1(NK),10000)/100)- KK)48,45,48
45    IF(MOD(KGOGN1(NK),100000)/10000-JJJ) 48,46,48
46    IDPRT=(MOD(KGOGN1(NK),100))
      IF(ITHPRT(IDPRT)-IDEL)48,47,48
47    XMOUNT=XMOUNT+CGOGN3(NK)
  48  CONTINUE
50    CONTINUE
      WRITE(6,51) IGEN,IDEL,KK,K,XMOUNT
51    FORMAT(1X,4I5,F8.0)
      GO TO (60,60,610),NCOUNT
610   IF (XMOUNT-6000.)60,72,72
60    CONTINUE
61    IF(XMOUNT-5000.)62,72,72
 62   GO TO (60,70,70),NCOUNT
70    IDEL=IDEL+1
      IF(IDEL-6)4000,4000,700
700   GO TO (80,80,71),NCOUNT
71    IGEN=IGEN+1
      IDEL=1
      IF(IGEN-6)4000,4000,80
72    NSAVE= MOD(ISHIP(K),10000)
      ISHIP(K) = NSAVE + KK*1000000
      ISHIP2(K) = KK + 100*IDEL
      THRCRG(IGEN,IDEL)= THRCRG(IGEN,IDEL)- .8*CAPACV(LSAVE)
      IF (IOUT)     76,76,75
75    WRITE(6,99) TIME,K,IGEN,IDEL
```

```
      WRITE(6,492) ISHIP(86),ISHIP2(86)
       WRITE(6,491) THRCRG(1,3),THRCRG(3,1),THRCRG(3,2),THRCRG(2,3)
492   FORMAT(1X,2I14)
491   FORMAT(1X,4F12.0)
76    LVENT1 = K
      LVENT2 = 2
      LVENT3 = 0
      TVENT = TIME
      CALL PUT
      NPOOL = NPOOL - 1
      IF (NPOOL)    90,90,80
80    CONTINUE
      WRITE(6,81) NCOUNT
81    FORMAT(1X,I3)
      NCOUNT=NCOUNT+1
      IF(NCOUNT-4)800,90,90
 90   LVENT1 = 0
      LVENT2 = 4
      LVENT3 = 0
      TVENT = TIME + 7.
      CALL PUT
      CALL TAKE
      RETURN
   99 FORMAT(/10X,4HAT  ,F5.1,16H DAYS, SHIP NO. ,I3,52H  -ENOVED FROM P
     1OOL TO CARRY CARGO BETWEEN THEATRES ,I2,5H AND ,I2)
      END
```

```
*DECK LOAD1
      SUBROUTINE LOAD
      COMMON
     1 NSTYPE,NNPORT,NFTYPE,NTHEA,NITIN,TFVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTAOM(6),CSTTON(6),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TTME,
     3 KEVENT(410),NEVENT, IVENT,LVENT1,LVENT2,LVENT3,TOSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NFPRT1(30),NFPRT2(30),ITMPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPRT(30),TTRAN,KFPRT1(30),KFPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLB,
     3 ADJCGO(8)
      COMMON
     1 KARGDL(30,8,6),NOPORT(30),NPREAC(30,6),KRGSHP(30,8),TOPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TWCLUS(25),TVAV(6,6),TWJS(6,6)
      COMMON/A/ ONRNAM(6,2)
      COMMON/B/ NTRAN(6),NNEAC(10),KCARG(6),NTEMP(6),TI,I,NPORT,NTYPE,
     1 J,LL,SHPWT,SHPVOL,NEAC,SAVTIM
      FOLT=0.0
  830 LSAVE = I + 100 * NPORT
      IF  (KPREF1(NTYPE) )    831,831,8301
 8301 DO 8302  JI = 1,3
      IEX = 1000 **(JI - 1)
      NTEMP(JI) = MOD(NFPRT1(I)/IEX,1000)
 8302 NTEMP(JI+3) = MOD(NFPRT2(I)/IEX,1000)
      JTEMP = KPREF1(NTYPE)
      IF (NTEMP(JTEMP))    8303,8303,831
 8303 IF  (KPREF2(NTYPE))    841,841,8304
 8304 JTEMP = KPREF2(NTYPE)
      IF  (NTEMP(JTEMP))   841,841,831
  831 IF (MOD(KGOGN1(J),10000) - LSAVE)  832,833,841
  832 J= J + 1
      IF  (J-NKGOGN)  831,831,94
  833 K = 1
      ISAVE = MOD(KGOGN1(J)/10000,10)
   84 IF (ISAVE - KCAPG(K) )  840,85,840
  840 K = K+1
      IF (K-5)  84,84,832
  841 RETURN
   85 IF (CGOGN3(J))  832,832,8500
 8500 IF (CGOGN3(J) - 34000.)     8502,8502,8501
 8501 SAVE2 = 34000.
      GO TO 850
 8502 SAVE2 = CGOGN3(J)
  850 IF (SAVE2-.80* CAPACV(NTYPE) + SHPVOL)  851,851,852
  851 SAVE = SAVE2
      GO TO 853
  852 SAVE=.80*CAPACV(NTYPE)-SHPVOL
  853 IF (SAVE/ADJCGO(ISAVE) - CAPACW(NTYPE) + SHPWT  )  855,855,854
  854 SAVEI = CAPACW(NTYPE) - SHPWT
      SAVE  = SAVEI * ADJCGO(ISAVE)
```

```
 855 IISAV= SAVE
     EQLT=SAVE*ADJCGO(ISAVE)+EQULT
     KRGSHP(NPORT,ISAVE) = KRGSHP(NPORT,ISAVE) + IISAV
     SHPWT  = SHPWT  + SAVE / ADJCGO(ISAVE)
     SHPVOL = SHPVOL + SAVE
     CGOGN3(J) = CGOGN3(J) - SAVE
     IF (II - 3)   87,86,87
  86 CSTSYS = CSTSYS +(DIST(NPORT,I) *  CSTTON(ISAVE) * SAVE) / 1000.
  87 L = 1
     SAVEI = 0.
  88 IF (NTRAN(L) )  881,882,881
 881 SAVEI = SAVEI + PRODUC(NFAC,L,ISAVE)
 882 L = L+ 1
     IF (L- 6)  86,88,90
  90 IF (LL-1)  92,92,91
  91 SAVEI = SAVEI * ADJTRN(NTYPE)
  92 SAVEI = SAVEI * ADJLD *ADJPRT(NPORT)
      IF(SAVEI.LE.0.) GO TO 8888
     SAVTIM = SAVTIM +  SAVE / SAVEI
8888 IF (II)  9205,9201,9205
9201 DO  9204    M=1,10
     IF (NNFAC(M) )       9203,9203,9202
9202 IF (NNFAC(M) - I)       9204,9205,9204
9203 NNFAC(M) = I
     GO TO 9205
9204 CONTINUE
9205 NSAVE = I + 100*IDSHIP
     M = 1
     JSAVE = SAVE
     IF (NKARGO)  930,935,930
 930 IF (MOD(KARGO(M),100000)- NSAVE) 931,932,933
 931 M = M+1
     IF (M-NKARGO)  930,930,935
 932 IF( MOD(KARGO(M)/100000,10) - ISAVE )     931,9321,931
9321 IF (KARGO(M)/1000000 + JSAVE - 34000 )    9322,9322,931
9322 KARGO(M) = KARGO(M) + JSAVE * 1000000
     GO TO 936
 933 N = NKARGO
 934 KARGO(N+1) = KARGO(N)
     N = N - 1
     IF (N-M)  935,934,934
 935 KARGO(M) = JSAVE*1000000 + NSAVE + ISAVE*100000
     NKARGO = NKARGO + 1
 936 IF (SHPWT - CAPACW(NTYPE) )  937,94,94
 937 IF (SHPVOL-.80*CAPACV(NTYPE)) 938,94,94
 938 IF (JSAVE - 33999)                          832,831,831
 94   RETURN
     END
```

```
*DECK MAIN1
      SUBROUTINE MAIN
      COMMON
     1 NSTYPE,NNPORT,NETYPE,NTHEA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(410),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITTN(10),NPITN1(10),NPTTN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NEPRT1(30),NEPRT2(30),ITHPRT(30),IDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPRT(30),TTRAN,KEPRT1(30),KEPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGDL(30,8,6),NQPORT(30),NPREAC(30,6),KRGSHP(30,8),TQPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      COMMON/SEL/IKE(30)
      COMMON/NN/NNTYPE(25),NCT,NNAVAIL,NNNA
      COMMON/NNTAB/NTAB(200),NT
      DIMENSION ITEMP(12), CARG(4), CHNGTH(3),NNTYPE(25)
      DIMENSION NOP(3)
      DATA ((ONRNAM(I,J),J=1,2),I=1,6)/5HBERTH,5HLINER,6HMSTS C,6HONTRL
     1,3HGAA,1H ,6HREQ / ,6HNAT.  ,6HS/S CO,6HNTNR  ,6HN/S/S ,6HCONTNR /
      DATA(NOP(I),I=1,3)/4HITIN,5HINTER,5HINTRA/
      DATA (CHNGTH(I),I=1,3)  /4HBOTH,4HDVRY,4HNONE /
      NT=0
      READ(5,10) ((( PRODUC(I,J,K),K=1,8),J=1,6),I=1,6)
   10 FORMAT(8F6.0,32X)
      READ(5,11)  (((DIST(I,J),J=1,30),I=1,30)
   11 FORMAT(10F6.0,20X)
      READ(5,12) (( KKTIME(I,J),J=1,6),I=1,6)
   12 FORMAT(36I2)
      READ(5,13)  ADJLD,TTRAN,ADJRAT,(ADJCGO(I),I=1,8),(CSTTON(I),I=1,8)
     1,(CSTADM(I),I=1,6)
   13   FORMAT (11F6.0/8F6.0/6F6.0)
      WRITE(6,101) ((( PRODUC(I,J,K),K=1,8),J=1,6),I=1,6)
  101  FORMAT(77H1 PRODUCTIVITY RATES BASED ON CARGO TYPE, TRANSFER SYSTE
     1M  AND FACILITY TYPE / (8F12.0)  )
      WRITE (6,102) ((DIST(I,J),J=1,30),I=1,30)
  102  FORMAT(//30H DISTANCE MATRIX FOR 30 PORTS / (10F12.0)  )
      WRITE (6,103)  ((KKTIME(I,J),J=1,6),I=1,6)
  103 FORMAT(//32H INTERTHEATER CYCLE TIMES (DAYS)  /(6(6I3,3X))       )
      WRITE  (6,104)  ADJCGO, CSTTON
  104  FORMAT(//48H CONVERSION FACTORS FOR EACH CARGO TYPE (MT/LT) /
     1 8F12.2//52H COST ($/MT) FOR COMMERCIALLY CARRIED CARGO BY TYPE /
     2 8F12.2)
      WRITE (6,105) ADJLD, TTRAN, ADJRAT
  105  FORMAT(//23H LOAD ADJUSTMENT FACTOR F8.2/ 34H TRANSIT TIME TO OR F
     1ROM SHIP POOL,F8.2/62H ACCEPTABLE PERCENTAGE OF HIGHEST AVAILABLE
     2PRODUCTIVITY RATE F8.2)
      READ (5,14) NITIN
```

```
 14 FORMAT(5I10,30X)
    IF (NITIN)     142,142,141
141 READ(5,14) (NPITIN(I),NPITN1(I),NPITN2(I),NTITN1(I),NTITN2(I),I=1,
   1 NITIN )
    ENTRY INITAL
142 TIME = 0.
    NEVENT = 0
    DO 151   I=1,25
    TVOLAV(I) = 0.
151 TVOLUS(I) = 0.
    DO 152   I=1,6
    DO 152   J=1,6
    TVAV(I,J) = 0.
152 TVUS(I,J) = 0.
    DO 16  I = 1,30
    KFPRT1(I) = 0
    KFPRT2(I) = 0
    NQPORT(I) = 0
    TQPORT(I) = 0.
    DO 161 J=1,6
161 NPRFAC(I,J) = 0
    DO 162 J = 1,8
    KRGSHP(I,J) = 0
    KRGGEN(I,J) = 0
    DO 162 K = 1,6
162 KARGDL(I,J,K) = 0
 16 CONTINUE
    NKARGO = 0
    ISW = 0
    CSTSYS = 0
    NQ1 = 0
    NQ2 = 0
    NQ3 = 0
    NQUEUE = 0
    NPOOL = 0
    DO 163  I = 1,410
163 KEVENT(I) = 0
    RN = .00191
    READ (5, 17) (RDENT(I), I = 1,12)
 17 FORMAT (12A6)
    READ (5,40) NSHIP,NSTYPE,NNPORT,NFTYPE,NTHEA,IOUT,TEVAL,TSTOP,TDEL
 40 FORMAT (6I9,3F6.0)
    READ (5,4001)(IKE(I),I=1,30)
4001  FORMAT (30I2)
    LVENT1 = 0
    LVENT2 = 6
    LVENT3 = 0
    TVENT = TSTOP
    CALL PUT
    LVENT2 = 5
    TVENT  = TEVAL + TDEL
    CALL PUT
    LVENT2 = 3
    TVENT  = 1.
    CALL PUT
    LVENT2 = 4
    TVENT  = 20.
```

```
      CALL PUT
      READ (5,14)    NKGOGN
      READ (5,401) (KGOGN1(I), KGOGN2(I), KGOGN4(I), I=1,NKGOGN)
401   FORMAT   (I14,2I10)
      READ (5,41)  (NFPRT1(I), NFPRT2(I), ITHPRT(I), TOLA(I), ADJPRT(I),
     1CSTHDL(I), OFTPRT(I), PRTNAM(I,1), PRTNAM(I,2), I = 1,NNPORT )
   41 FORMAT (2I9, I1, 4F6.0, 2A6 ,25X)
      READ (5,42)  (SPEED(I), CAPACW(I), CAPACV(I), CSTSFA(I), CSTPRT(I)
     1, DRAFT(I), ADJTRN(I), KTRANS(I), KARSHP(I), KPREF1(I), KPREF2(I),
     2 KCHANG(I), I = 1,NSTYPE)
   42 FORMAT (7F8.0,2I8, 3I1,5X)
      READ (5,43)  (ISHIP(I), ISHIP2(I), I = 1,NSHIP)
   43 FORMAT (4(I11,I6),12X)
      READ(5,501)NCT
      READ(5,502)(NNTYPE(I),I=1,NCT)
      READ(5,503)NNAVAIL
      READ(5,504)NNNA
  501 FORMAT(I3)
  502 FORMAT(40I2)
  503 FORMAT(I3)
  504 FORMAT(I3)
      DO 403 I=1,NSHIP
      OWNER=MOD(ISHIP(I)/100,10)
      IF(OWNER.NE.2) GO TO 33333
      ISHIP(I)=ISHIP(I)-NNNA*100000000
      GO TO 403
33333 OTYPE=MOD(ISHIP(I),100)
      DO 4033 J=1,NCT
      IF(OTYPE.EQ.NNTYPE(J)) GO TO 43333
 4033 CONTINUE
      GO TO 40333
43333 NAVAIL=ISHIP(I)/100000000
      IF(NAVAIL.LE.NNAVAIL) GO TO 4031
      IF(NAVAIL.EQ.320) GO TO 403
40333 ISHIP(I)=200000000+MOD(ISHIP(I),100000000)
      GO TO 403
 4031 ISHIP(I)=(ISHIP(I)/100000000-NNNA)*100000000+MOD(ISHIP(I),
     C100000000)
  403 CONTINUE
      DO 55   I = 1, NKGOGN
55    CGOGN3(I) = 0.
      TEMP = TOEL + TEVAL
      WRITE (6,60) (RDENT(I),I=1,12),NSTYPE,NSHIP,NTHEA,NNPORT,NFTYPE,
     1 NITIN,TEVAL,TSTOP  ,TEMP
   60 FORMAT (32H1   G E N E R A L    I N P U T S ///6X,25HDATA IDENTIF+
     1CATION IS   12A6///6X,28HNUMBER OF SHIP TYPES IN GAME 8X,1H=,I7/
     26X,23HNUMBER OF SHIPS IN GAME 13X,1H=,I7/6X,26HNUMBER OF THEATRES
     3IN GAME 10X,1H=I7/6X,23HNUMBER OF PORTS IN GAME 13X,1H=I7/6X,32HNU
     4MBER OF FACILITY TYPES IN GAME 4X,1H=I7/6X29HNUMBER OF TTINERARIES
     5 IN GAME 7X,1H=I7//6X,63HTIME INTERVAL BETWEEN PERIODIC SYSTEM STA
     6TUS PRINTOUT (IN DAYS)  IS F7.0//6X,44HTIME FOR MAXIMUM LENGTH OF
     7PLAY IN DAYS  IS  F7.0 // 6X,45H FIRST SYSTEM STATUS PRINTOUT(+N D
     8AYS) IS AT F7.0//)
      DO 61  I = 1,6
      WRITE (6,62)  I, (ONRNAM(I,N),N=1,2), CSTADM(I)
   61  CONTINUE
   62 FORMAT(6X,36HDIFFERENTIAL   COST  FOR OWNER TYPE I3,3X, 2A6,5H  IS
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```
     1 F10.2,14H  DOLLARS/DAY  )
       IF  (NITIN)              621,621,6101
 6101 WRITE(6,611)
  611  FORMAT(//6X,16HITINERARY INPUTS/,10X,13HITINERARY NO., 8X,28HPORTS
     1ON ITINERARY(IN ORDER) / )
       DO 615  I = 1,NITIN
      ITEMP(1) = MOD(NPITN1(I),100)
      ITEMP(2) = MOD(NPITN1 (I)/100,100)
      ITEMP(3) = MOD(NPITN1 (I)/10000,100)
      ITEMP(4) = MOD(NPITN1 (I)/1000000,100)
      ITEMP(5) = MOD(NPITN1 (I)/100000000,100)
      IF (NPITIN(I) - 5)       613,613,612
  612 ITEMP(6) = MOD(NPITN2(I) ,100 )
      ITEMP(7) = MOD(NPITN2(I)/100,100)
      ITEMP(8) = MOD(NPITN2(I)/10000,100)
      ITEMP(9) = MOD(NPITN2(I)/1000000,100)
      ITEMP(10)= MOD(NPITN2(I)/100000000,100)
  613 K = NPITIN(I)
      WRITE (6,614)  I, (ITEMP(J), J = 1,K)
  614  FORMAT(15X,I2, 14X,10I6)
  615  CONTINUE
  621 WRITE(6,63)
   63 FORMAT(36H1...P O R T    I N F O R M A T I O N ///10X,4HPORT,11X,
     17HTHEATRE,4X,4HPORT,6X,6HADJUST,4X,5HCARGO,5X,4HMAX.,5X,      9X,
     234HNO. FACILITIES AVAILABLE (BY TYPE) / 25X,7HOF PORT,4X,5HDELAY,
     36X,3HFOR,6X,6HHANDLE,4X,5HDRAFT             /36X,4HTIME,6X,6HPRODUC
     44X,6HCST/DA,4X,4H(FT),5X,         9X,2H 1,4X,2H 2,4X,2H 3,4X,2H 4,
     54X,2H 5,4X,2H 6 /36X,6H(DAYS)5X,4HRATE,5X,5H( $ ) ///)
       DO 65 I = 1,NNPORT
       ITEMP(1) =  MOD(NFPRT1(I),1000)
       ITEMP(2) =  MOD(NFPRT1(I)/1000,1000)
       ITEMP(3) = NFPRT1(I)/1000000
       ITEMP(4) =  MOD(NFPRT2(I),1000)
       ITEMP(5) =  MOD(NFPRT2(I)/1000,1000)
       ITEMP(6) =  NFPRT2(I)/1000000
        WRITE(6,66) I,PRTNAM(I,1), PRTNAM(I,2), ITHPRT(I), TOLA(I),
          1PPT(I), CSTHDL(I), DFTPRT(I), (ITEMP(N),N=1,6)
   66    FAT( 6X, I2, 2X,2A6,5X,I3,7X,F4.1,5X,F5.3,3X,F8.0,4X,F5.0,9X,
        .3X,I3)/)
   65 CONTINUE
      WRITE (6,70)
   70 FORMAT(//47H ...S H I P    T Y P E    I N F O R M A T I O N ///6X,
     14HSHIP,3X,5HSPEED4X,5HCARGO4X,5HCARGO4X,4HCOST7X,4HCOST6X,4HSHIP,
     25X,5HMULTI5X,3HNO.3X,12H   BY TYPE   4X,11HCARGO TYPES3X,8HFACILIT
     3Y 3X,4HTHTR /6X, 4HTYPE ,
     443X,5H(KTS)5X,2HWT7X,3HVOL5X,6HAT SEA4X,7HIN PORT4X,5HDRAFT4X,
     55HTRANS5X,5HTRANS,1X,12H 1 2 3 4 5 617X,10HPREFERENCE,2X,4HCHNG /
     622X,4H(LT)6X,4H(MT)4X,6H($/DA)
     7  5X,6H($/DA)4X,4H(FT)5X,6HADJUST4X,4HSYST ,3X,12H(0=NO,1=YES) /
     8 70X,6HFACTOR /  )
       DO  71  I = 1,NSTYPE
       ITEMP(1) = MOD(KTRANS(I),10)
       ITEMP(2) = MOD(KTRANS(I)/10,10)
       ITEMP(3) = MOD(KTRANS(I)/100,10)
       ITEMP(4) = MOD(KTRANS(I)/1000,10)
       ITEMP(5) = MOD(KTRANS(I)/10000,10)
       ITEMP(6) = MOD(KTRANS(I)/100000,10)
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```
      ITEMP(7) = MOD(KTRANS(I)/1000000,10)
      ITEMP(8)  =  MOD(KARSHP(I),10)
      ITEMP(9)  =  MOD(KARSHP(I)/10,10)
      ITEMP(10) =  MOD(KARSHP(I)/100,10)
      ITEMP(11) =  MOD(KARSHP(I)/1000,10)
      ITEMP(12) =  MOD(KARSHP(I)/10000,10)
      JTEMP = KCHANG(I)
      DISTR = CHNGTH(JTEMP+1)
      WRITE(6,72)  I,SPEED(I),CAPACW(I),CAPACV(I),CSTSEA(I),CSTPRT(I),
     1DRAFT(I),ADJTRN(I),(ITEMP(N),N=1,12),KPREF1(I), KPREF2(I) ,DISTR
   72 FORMAT(4X,I2,3X,F5.1,3X,F7.0,2X,F8.0,2X,F6.0,4X,F6.0,3X,F5.0,4X,
     1 F6.3,5X,I2,3X,6(1X,I1),4X,5(1X,I1),6X,I1,4X,I1 ,3X,A4 / )
      SPEED(I) = SPEED(I)*24.
   71 CONTINUE
      WRITE (6,740)
  740 FORMAT (37H1. . .  C A R G O   G E N E R A T E D //
     110X,*NO.     TYPE     ORIGIN     DESTIN     AMOUNT     FIRST     F
     2REQ     CHANGE     NEW     LAST*/
     328X,*PORT*,7X,*PORT*,18X,*DAY*,16X,*FREQ*,5X,*FREQ*,6X,*DAY*,///)
      DO 745 I=1,NKGOGN
      ITEMP(1) = MOD(KGOGN1(I)/10000, 10)
      ITEMP(2) = MOD(KGOGN1(I)/100,100)
      ITEMP(3) = MOD(KGOGN1(I),100)
  741 ITEMP(4) = MOD(KGOGN2(I),100000)
      ITEMP(5)=MOD(KGOGN1(I)/100000000,1000)
      ITEMP(6) = MOD(KGOGN1(I)/1000000,100)
  743 ITEMP(7) = KGOGN4(I)/100
      ITEMP(8) = MOD(KGOGN4(I),100)
      ITEMP(9)=KGOGN1(I)/100000000000
      WRITE(6,744) I, (ITEMP(J),J=1,9)
  744 FORMAT (10X,I2,7X,I2,8X,I2,9X,I2,7X,I6,5X,I3,7X,I3,7X,I3,
     1 7X,I3,5X,I3)
  745 CONTINUE
      WRITE(6,75)
   75 FORMAT(56H1  S H I P    I N I T I A L I Z A T I O N    V A L U E S
     1// ,6X,4HSHIP4X,4HSHIP4X,4HSHIP6X,4HSHIP7X,8HDELIVER4X,4HHOME4X,
     27HINITIAL,5X,4HTIME ,  2X,*OPERATIONAL*/
     3          6X,3HNO.5X,4HOWNR4X,4HTYPE4X,9HITINERARY4X,7HTHEATRE5X,
     44HPORT5X,4HPORT,7X,5HAVAIL ,3X,*TYPE*//)
      DO  76  I = 1,NSHIP
      JSAVE = ISHIP(I)/100000000
      IF (JSAVE - 320)              761,760,760
  760 NPOOL = NPOOL + 1
      ISHIP(I) = MOD(ISHIP(I),1000000000) + 30 * 100000000
      GO TO 762
  761 LVENT1 = I
      LVENT2 = 2
      LVENT3 = 0
      TVENT = JSAVE
      CALL  PUT
      ISHIP(I) = MOD(ISHIP(I),1000000000)
  762 ITEMP(1) = MOD(ISHIP(I)/100,10)
      ITEMP(2) = MOD(ISHIP(I),100)
      ITEMP(3) = MOD(ISHIP(I)/10000,100)
      ITEMP(4) = MOD (ISHIP2(I)/100,10)
      ITEMP(5) = MOD (ISHIP2(I),100)
      ITEMP(6) = MOD(ISHIP(I)/1000000,100)
```

```
      OP= MOD(ISHIP(I)/1000,10)  +1
      WRITE(6,77) I, (ITEMP(N), N = 1,6)  ,JSAVE,NOP(OP)
   77 FORMAT(6X,I3,6X,I2,6X,I2,8X,I2,11X,I2,8X,I2,7X,I2,7X,I3,7X,A5)
   76 CONTINUE
      WRITE (6,78)
78    FORMAT(1H1)
      CALL TAKE
      RETURN
      END
```

```
*DECK MOVF1
      SUBROUTINE MOVF
C COMMON FOR GENERAL INPUTS AND VARIABLES
      COMMON
     1 NSTYPE,MNPORT,NFTYPE,NTHEA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVEN(4100),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,RN
C COMMON FOR SHIP VARIABLES AND ITINERARY PORTS
      COMMON
     1 SPEED(25),CAPACM(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
C COMMON FOR PORT VARIABLES AND FACILITY DATA
      COMMON
     1 NFPRT1(30),NFPRT2(30),TTHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPRT(30),TTRAN,KFPRT1(30),KFPRT2(30),ADJRAT,PRTNAM(30,2)
C COMMON FOR CARGO AND QUEUE INFO
      COMMON
     1 NKARGO,KARGO(4800),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
C COMMON FOR OUTPUT VARIABLES
      COMMON
     1 KARGOL(30,8,6),NQPORT(30),NPREAC(30,6),KRGSHP(30,8),TQPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      COMMON/NNTAB/NTAB(200),NT
      ISAVE = MOD(ISHIP(IDSHIP),100)
      JSAVE = MOD(ISHIP(IDSHIP)/10000,100)
      KSAVE = MOD(ISHIP(IDSHIP)/1000000,100)
      MSAVE = MOD(ISHIP(IDSHIP)/100,10)
      NQ1 = MOD( ISHIP2(IDSHIP) / 1000000,100 )
      IF (ISHIP(IDSHIP)/100000000)                    45,5,45
    5 IF (JSAVE)                                      50,10,50
   10 SAVTIM = DIST(NQ1,KSAVE)/SPEED(ISAVE)
   15 CSTSYS = CSTSYS + SAVTIM * (CSTSEA(ISAVE) + CSTADM(MSAVE))
   20 LVENT1 = IDSHIP
      LVENT2 = 2
      LVENT3 = 0
      TVENT  = TIME + SAVTIM
      CALL PUT
      IF(IOUT)      25,25,24
   24 WRITE (6,86)  TIME, IDSHIP, NQ1, KSAVE  ,TVENT
   25 NQ2  =  MOD(KWORD/10000,10)
      NT=NT+1
       NTAB(NT)=(((MOD(ISHIP(IDSHIP),100))*100+NQ1)*100+KSAVE)*
     C100000+TVENT
      NQ3  =  0
      CALL QUEUE
      IF  (NQ3)                                       75,30,75
   30 IF  (NQ2 - 3)                                   35,35,48
   35 KFPRT1(NQ1) = KFPRT1(NQ1) - 1000**(NQ2-1)
      CALL TAKE
   40 KFPRT2(NQ1) = KFPRT2(NQ1) - 1000**(NQ2-4)
      CALL TAKE
   45 NPOOL = NPOOL + 1
```

```
      CSTSYS = CSTSYS + TYRAN*(CSTSEA(ISAVE) + CSTAOM(MSAVE) )
      IF (IOUT)    25,25,46
   46 MSAVE = MOD(ISHIP2(IDSHIP) / 100,10)
      WRITE (6,47) TIME,IDSHIP,NQ1,MSAVE
   47 FORMAT (/10X,4HAT  ,F5.1,16H DAYS, SHIP NO. ,I3,14H LEAVING PORT ,
     1I2,52H TO JOIN THEATER POOL.  CURRENT DELIVERY THEATER IS ,I3)
      GO TO 25
   50 I = ISHIP2(IDSHIP)/100000000
      IF (I)                                          55,99,55
   55 IF (I - 5)                                      60,60,70
   60 SAVTIM = MOD(NTITN1(JSAVE)/100 **(I-1),100)
   65 IF (MSAVE - 1)                                  15,20,15
   70 SAVTIM = MOD(NTITN2(JSAVE)/100 **(I-6),100)
      GO TO 65
   75 ISW = NQ2
      GO TO 65
   86 FORMAT(/10X,4HAT  ,F5.1,16H DAYS, SHIP NO. ,I3,14H LEAVING PORT ,
     1I2,16H BOUND FOR PORT ,I2  ,7H ETA = ,F5.1,5H DAYS  )
   99 WRITE (6,101)
  101 FORMAT (///79H YOUR ERROR IS THAT A SHIP IS LEAVING A FACILITY TYP
     1E ZERO WHICH IS NONEXISTENT///)
      CALL ENDGAM
      RETURN
      END
```

```
*DECK PORT1
      SUBROUTINE PORT
      COMMON
     1 NSTYPE,NNPORT,NETYPE,NTHFA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(8),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TTME,
     3 KEVENT(410),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,PN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NEPRT1(30),NEPRT2(30),ITHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DETPRT(30),TTRAN,KEPRT1(30),KEPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGOL(30,8,6),NOPORT(30),NPREAC(30,6),KRGSHP(30,8),TOPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      COMMON/B/ NTRAN(6),NNEAC(10),KCARG(6),NTEMP(6),II,I,NPORT,NTYPE,
     1 J,LL,SHPWT,SHPVOL,NEAC,SAVTIM
      WEIGHT=DENSITY=VOLUME= 0.0
      IF (ISW)  1,1,50
    1 NTYPE = MOD(ISHIP(IDSHIP),100)
      NPORT = MOD(ISHIP(IDSHIP)/1000000,100)
      I = 1
      KARAMT = 0
      KARTYP = 0
      LSAVE = NPORT + 100 * IDSHIP
    4 IF ( MOD(KARGO(I),100000) - LSAVE)   7,5,8
    5 MSAVE = KARGO(I) / 1000000
      IF (MSAVE-KARAMT) 7,7,6
    6 KARAMT = MSAVE
      KARTYP = MOD(KARGO(I)/100000, 10)
    7 I = I + 1
      IF (I-NKARGO)  4,4,8
    8 I = 1
      LL = MOD(KTRANS(NTYPE),10)
      NSAVE = KTRANS(NTYPE) / 10
    9 NTRAN(I) = MOD( NSAVE/10**(I-1) ,10 )
      I  = I + 1
      IF (I-6)  9,9,12
   12 I = 1
 13   IEX = 1000 **(I-1)
      NTEMP(I  ) = MOD(NEPRT1(NPORT) / IEX ,1000)
      NTEMP(I+3) = MOD(NEPRT2(NPORT) / IEX ,1000)
      NNEAC(I  ) = NTEMP(I  ) - MOD(KEPRT1(NPORT) / IEX,1000)
      NNEAC(I+3) = NTEMP(I+3) - MOD(KEPRT2(NPORT) / IEX,1000)
      I = I + 1
      IF (I-3) 13,13,1501
 1501 IF (KPREF1(NTYPE) )     16,16,1502
 1502 I = KPREF1(NTYPE)
      IF (NNEAC(I)-1 )     1503,39,39
 1503 IF (KPREF2(NTYPE) )    1509,1509,1504
```

```
1504 I = KPREF2(NTYPE)
     IF (KNFAC(I) - 1)       1505,39,39
1505 I = KPREF1(NTYPE)
     IF (NTEMP(I) )     1508,1508,1507
1507 JSAVE = I
     GO TO 46
1508 I = KPREF2(NTYPE)
1509 IF (NTEMP(I) )     16,16,1507
  16 IF (KARANT)  161,22,161
 161 I = 1
     SAVE = 0.
 162 IF (NTRAN(I))  163,20,163
 163 J = 1
 164 IF (NTEMP(J))        19,19,17
  17 IF (PRODUC(J,I,KARTYP)-SAVE)  19,19,18
  18 SAVE = PRODUC(J,I,KARTYP)
     JSAVE = J
     ISAVE = I
  19 J = J+1
     IF  (J-6)       164,164,20
  20 I = I + 1
     IF (I-6)  162,162,30
  22 I = 1
     MSAVE = 0
  23 IF (NNFAC(I)-MSAVE)  25,25,24
  24 MSAVE = NNFAC(I)
     LSAVE = I
  25 I= I+1
     IF (I-6)  23,23,26
  26 IF (MSAVE)  40,40,27
  27 I = LSAVE
     GO TO 39
  30 IF (NNFAC(JSAVE))   31,31,38
  31 BEST = 0.
     SAVE =  SAVE * ADJRAT
     I = 1
  32 IF (NNFAC(I))  35,35,33
  33 IF (PRODUC(I,ISAVE,KARTYP) - BEST)  35,35,34
  34 BEST = PRODUC(I,ISAVE,KARTYP)
     KSAVE = I
  35 I = I + 1
     IF (I-6)  32,32,36
  36 IF (BEST - SAVE)  46,46,37
  37 I = KSAVE
     GO TO 39
  38 I = JSAVE
  39 IF (I-3)  392,392,391
 391 KFPRT2(NPORT) = KFPRT2(NPORT) + 1000**(I-4)
     GO TO 393
 392 KFPRT1(NPORT) = KFPRT1(NPORT) + 1000**(I-1)
 393 NPRFAC(NPORT,I) = NPRFAC(NPORT,I) + 1
     KOWNER = MOD(ISHIP(IDSHIP)/100,10)
     NFAC = I
     KMODE = MOD(ISHIP(IDSHIP)/1000 ,10)
     SAVTIM = 0.
     L = 1
     N = 0
```

```
3931 MSAVE = IDSHIP*100 + NPORT
     IF (MOD(KARGO(L),100000) - MSAVE)      394,399,395
 394 L = L + 1
     IF (L - NKARGO)                        3931,3931,395
 395 IF (N)                                 70,70,396
 396 KSTART = L - N
     KSTOP = NKARGO - N
     DO  397  L = KSTART,KSTOP
     K = L + N
 397 KARGO(L) = KARGO(K)
     KSTART = KSTOP + 1
     KSTOP = NKARGO
     DO  398  L = KSTART,KSTOP
 398 KARGO(L) = 0
     NKARGO = NKARGO - N
     GO TO 70
 399 KARGNO = KARGO(L)
     N = N + 1
     GO TO 60
  40 DO 400 JJ=1,6
 400 NTRAN(JJ) = 0
     J = 1
     I = 1
  41 IF ( MOD(KQUEUE(I),100) - NPORT)   44,42,47
  42 J = MOD(KQUEUE(I)/100000,10)
     NTRAN(J) = NTRAN(J) + 1
     IF (J-1)  44,44,43
  43 IF (NTRAN(J-1) )        431,431,44
 431 IF (NTEMP(J-1) )       44,44,45
  44 I = I+1
     IF (I-NQUEUE)  41,41,47
  45 JSAVE = J-1
  46 KTIME = 10. * TIME
     NQ1 = NPORT
     NQ2 = JSAVE
     NQ3 = NPORT + (100*(IDSHIP + 1000 * (JSAVE + 10 * KTIME) ) )
     IF (IOUT)      462,462,460
 460 WRITE (6,461)  TIME,IDSHIP, NPORT, JSAVE
 462 CALL QUEUE
     CALL TAKE
  47 IF (NTRAN(J) )  481,479,481
 479 IF (NTEMP(J) )   481,481,480
 480 JSAVE = J
     GO TO 46
 481 MSAVE = 500
     JSAVE = 0
     I = 1
 490 IF (NTRAN(I) - MSAVE) 4901,492,492
4901 IF (NTEMP (I) )        492,492,491
 491 MSAVE = NTRAN(I)
     JSAVE = I
 492 I = I+1
     IF (I-6)  490,490,46
  50 I = ISW
     ISW = 0
     NPORT = MOD(NQ3,100)
     IDSHIP = MOD(NQ3/100,1000)
```

```
      IF (IOUT)   502,502,500
  500 WRITE (6,501)  TIME, IDSHIP, NPORT
  502 LSAVE  = NO3 / 1000000
      SAVE   = FLOAT(LSAVE) / 10.
      SAVE   =  TIME - SAVE
      TQPORT(NPORT) = TQPORT(NPORT) + SAVE
      NTYPE = MOD(ISHIP(IDSHIP),100)
      KOWNER = MOD(ISHIP(IDSHIP)/100,10)
      CSTSYS = CSTSYS+SAVE*(CSTPRT(NTYPE)+CSTADM(KOWNER) )
      K = 1
      LL = MOD(KTRANS(NTYPE),10)
      NSAVE = KTRANS(NTYPE)/10
   51 NTRAN(K) = MOD(NSAVE/10**(K-1),10)
      K=K+1
      IF (K- 6)  51,51,393
   60 KARTYP = MOD(KARGNO/100000,10)
      KARAMT = KARGNO/1000000
      VOLUME= FLOAT(KARAMT)/ADJCGO(KARTYP) +VOLUME
      WEIGHT = FLOAT(KARAMT)  + WEIGHT
      DENSITY= WEIGHT/VOLUME
      KARGDL(NPORT,KARTYP,KOWNER) = KARGDL(NPORT,KARTYP,KOWNER) + KARAMT
      I = 1
      SAVE = 0
   61 IF (NTRAN(I))  62,63,62
   62 SAVE = SAVE + PRODLC(NFAC,I,KARTYP)
   63 I = I + 1
      IF (I- 6)  61,61,64
   64 IF (LL-1)  65,66,65
   65 SAVE = SAVE * ADJTRN(NTYPE)
   66 IF(SAVE.GT.0.) GO TO 67
       GO TO 394
   67 SAVTIM = SAVTIM + FLOAT(KARAMT)/(SAVE* ADJPRT(NPORT))
      GO TO 394
   70 ITINN = MOD(ISHIP(IDSHIP)/10000 ,100)
CKRGSUM - SUMS CARGO ABOARD IN WEIGHT AND VOLUME FOR SHIP NUMBER(IDSHIP)
      DO 700  I = 1,10
  700 NNFAC(I) = 0
      I = 0
      L = 1
      SHPWT = 0
      SHPVOL = 0
   71 IF ( MOD(KARGO(L)/100,1000) - IDSHIP )  75,72,76
   72 ISAVE = MOD(KARGO(L)/100000,10)
      SAVE  = KARGO(L) / 1000000
      SHPVOL = SHPVOL + SAVE
      SHPWT  = SHPWT  + SAVE / ADJCGO(ISAVE)
      IF (I-10)  73,75,75
   73 ISAVE = MOD(KARGO(L),100)
      IF (I)   731,74,731
  731 IF (ISAVE - NNFAC(I) )  74,75,74
   74 I = I + 1
      NNFAC(I) = ISAVE
   75 L = L + 1
      IF (L-NKARGO) 71,71,76
   76 DO  761  I = 1,5
  761 KCARG(I) = MOD ( KARSHP (NTYPE) / 10**(I-1), 10)
      IF (ITINN)  170,77,170
```

```
 77 IF (KMODE - 1)  770,771,770
770 MSAVE = ITHPRT(NPORT)
    GO TO 80
771 MSAVE = MOD(ISHIP2(IDSHIP)/100,10)
    IF (ITHPRT(NPORT) - MSAVE)  80,772,80
772 MSAVE = MOD(ISHIP2(IDSHIP),100)
    MSAVE = ITHPRT(MSAVE)
 80 I = 1
    J = 1
    II = 0
 81 IF (I - NPORT)  82,842,82
 82 IF (ITHPRT(I) - MSAVE)  842,83,842
 83 IF (DFTPRT(I)-DRAFT(NTYPE) )  842,830,830
830 CALL LOAD
    IF (J - NKGOGN)                          831,831,942
831 IF (SHPWT - CAPACW(NTYPE) )              832,942,942
832 IF (SHPVOL-.80*CAPACV(NTYPE))  842,942,942
842 I = I + 1
    IF (I - NNPORT)                          81,81,942
942 I= 1
    NSAVE = 999999
    JSAVE = 0
 95 J = NNFAC(I)
    IF (J)  951,954,951
951 IF (ITHPRT(J) - ITHPRT(NPORT) )  954,952,954
952 IDIST = DIST(NPORT,J)
    IF (IDIST - NSAVE) 953,954,954
953 NSAVE = IDIST
    JSAVE = J
954 I = I + 1
    IF (I-10)  95,95,97
 97 IF (JSAVE)  110,98,110
 98 IF (KMODE - 1)  150,120,150
110 NSAVE = MOD(ISHIP(IDSHIP),1000000)
    ISHIP(IDSHIP)=  NSAVE + JSAVE * 1000000
    IF (KMODE - 1)  117,112,117
112 IF (ITINN)  117,113,117
113 IF (SHPWT-CAPACW(NTYPE))  114,117,117
114 IF (SHPVOL-.80*CAPACV(NTYPE)) 115,117,117
115 IF (DFTPRT(JSAVE)-DRAFT(NTYPE))  117,116,116
116 II = 1
    J  = 1
    I  = JSAVE
    CALL LOAD
117 CSTSYS=CSTSYS+(TDLA(NPORT)+SAVTIM)*(CSTPRT(NTYPE)+CSTADM(KOWNER))
    CSTSYS = CSTSYS + SAVTIM*CSTHDL(NPORT)
1171 NSAVE = MOD(ISHIP2(IDSHIP),1000000)
    LSAVE = ISHIP2(IDSHIP) / 100000000
    ISHIP2(IDSHIP) = NPORT*1000000 + NSAVE + LSAVE * 100000000
    TVENT = TIME + SAVTIM + TDLA(NPORT)
    LVENT1 = IDSHIP
    LVENT2 = 1
    LVENT3 = NFAC
    IF (IOUT)     119,119,118
118 TOUT = TVENT - TIME
    SCN = 100. *SHPVOL / CAPACV(NTYPE)
    WRITE (6,1191)    TIME,IDSHIP, NPORT, NFAC, TOUT ,SHPVOL,SCN
```

```
      IF (VOLUME) 119,119,88000
88000 IF(KTRANS(NTYPE).EQ. 11      ) NCGO = 1
      IF(KTRANS(NTYPE).EQ.1000001 ) NCGO = 3
      IF(KTRANS(NTYPE).EQ. 1001   ) NCGO = 5
      IF(KTRANS(NTYPE).EQ. 10001  ) NCGO = 4
  119 CALL PUT
      CALL TAKE
      RETURN
  120 MSAVE = MOD(ISHIP2(IDSHIP)/100,10)
      IF (ITHPRT(NPORT)-MSAVE) 130,121,130
  121 LSAVE = MOD(ISHIP2(IDSHIP),100)
      IF (SHPWT)  1251,1251,1221
 1221 I = 1
      NSAVE = 999999
      KSAVE = 0
  123 J = NNFAC(I)
      IF (J) 1230,124,1230
 1230 IF (J-LSAVE)  1232,1231,1232
 1231 KSAVE = J
      GO TO 127
 1232 IDIST = DIST(J,NPORT)
      IF (IDIST - NSAVE)  1233,124,124
 1233 NSAVE = IDIST
      KSAVE = J
  124 I = I + 1
      IF (I-10) 123,123,125
  125 IF (KSAVE)  127,1251,127
 1251 KSAVE = LSAVE
  127 SAVEI = DIST(KSAVE,NPORT) / SPEED(NTYPE)
      SAVEI = TIME + SAVTIM + SAVEI + TOLA(NPORT)
      NSAVE = SAVEI
      ISHIP2(IDSHIP) = MOD(ISHIP2(IDSHIP),1000) + 1000 * NSAVE
  128 NSAVE = MOD(ISHIP(IDSHIP),1000000)
      ISHIP(IDSHIP) = NSAVE + KSAVE * 1000000
      GO TO 117
  130 IF (SHPVOL - .80 * CAPACV(NTYPE)) 1301,140,140
 1301 IF (SHPWT- .80* CAPACW(NTYPE)) 131,140,140
  131 MSAVE = MOD(ISHIP2(IDSHIP)/100,10)
      NSAVE = ITHPRT(NPORT)
      ISAVE = KKTIME(NSAVE,MSAVE)
      JSAVE = MOD(ISHIP2(IDSHIP)/1000 ,1000 )
      LSAVE = TIME
      JSAVE = LSAVE - JSAVE
      IF (3*JSAVE - ISAVE)  1322,1322,1321
 1321 IF (SHPVOL- .2*CAPACV(NTYPE))  1322,1322,140
 1322 I = 1
      J = 1
      SAVEI = 0.
      M = 0
      SAVEJ = 0.
  133 IF (ITHPRT(I)-NSAVE) 1354,1330,1354
 1330 IF (I - NPORT)          1331,1354,1331
 1331 IF (DFTPRT(I)-DRAFT(NTYPE))  1354,1332,1332
 1332 IF (KPREF1(NTYPE))  1333,1333,13320
13320 DO 13321  JI = 1,3
      IEX = 1000 **(JI - 1)
      NTEMP(JI) = MOD(NFPRT1(I)/IEX,1000)
```

```
13321 NTEMP(JI+3) = MOD(NFPRT2(I)/IEX,1000)
      JTEMP = KPREF1(NTYPE)
      IF (NTEMP(JTEMP))  13322,13322,1333
13322 IF(KPREF2(NTYPE))  1354,1354,13323
13323 JTEMP = KPREF2(NTYPE)
      IF (NTEMP(JTEMP))  1354,1354,1333
 1333 K = 1
  134 IF (ITHPRT(K)-MSAVE)  135,1341,135
 1341 IF (DFTPRT(K)-DPAFT(NTYPE)) 135,1342,1342
 1342 IF (KPREF1(NTYPE))  1343,1343,13420
13420 DO 13421  JI = 1,3
      IEX = 1000 **(JI - 1)
      NTEMP(JI) = MOD(NFPRT1(K)/IEX,1000)
13421 NTEMP(JI+3) = MOD(NFPRT2(K)/IEX,1000)
      JTEMP = KPREF1(NTYPE)
      IF (NTEMP(JTEMP))  13422,13422,1343
13422 IF(KPREF2(NTYPE))  135,135,13423
13423 JTEMP = KPREF2(NTYPE)
      IF (NTEMP(JTEMP))  135,135,1343
 1343 ISAVE = K + 100* I
      GO TO 13722
  135 K = K + 1
      IF (K - NNPORT)  134,134,1351
 1351 IF (SAVET - SAVEJ)  1353,1353,1352
 1352 JSAVE = I
      SAVEJ = SAVEI
 1353 SAVEI = 0.
 1354 I = I + 1
      IF (I - NNPORT)  133,133,1361
 1361 IF (SAVEJ - 500.)        136,110,110
  136 IF (SHPWT) 160,160,140
  137 IF (MOD(KGOGN1(J),10000) - ISAVE)  1     1372,135
 1371 J = J + 1
13722 IF (J- NKGOGN) 137,137,1351
 1372 L = 1
      JSAV2 = MOD(KGOGN1(J)/10000,10)
 1373 IF (KCARG(L)-JSAV2)  1374,1375,1374
 1374 L = L + 1
      IF (L-5)  1373,1373,1371
 1375 SAVEI = SAVEI + CGOGN3(J)
      GO TO 1371
  140 I = 1
      ISAVE = 999999
      KSAVE = 0
  141 IF (NNFAC(I))  142,143,142
  142 J = NNFAC(I)
      IDIST = DIST(NPORT,J)
      IF (IDIST-ISAVE)  1421,143,143
 1421 ISAVE = IDIST
      KSAVE = J
  143 I = I + 1
      IF (I-10)  141,141,144
  144 IF (KSAVE)  1441,145,1441
 1441 TVOLAV(NTYPE) = TVOLAV(NTYPE) + CAPACV(NTYPE)
      TVOLUS(NTYPE) = TVOLUS(NTYPE) + SHPVOL
      IP = ITHPRT(NPORT)
      JD = ITHPRT(KSAVE)
```

```
      TVAV(IP,JD) = TVAV(IP,JD) + CAPACV(NTYPE)
      TVUS(IP,JD) = TVUS(IP,JD) + SHPVOL
      GO TO 128
  145 WRITE (6,146) IOSHTP, NPORT, MSAVE
      CALL ENDGAM
  150 NSAVE = ITHPRT(NPORT)
      I = 1
      K = 1
      SAVEI = 0.
      SAVEJ = 0.
  151 IF (ITHPRT(I)-NSAVE)  1543,1512,1543
 1512 IF (DFTPRT(I)-DRAFT(NTYPE)) 1543,15121,15121
15121 IF (KPREF1(NTYPE))  1513,1513,1514
 1514 DO 15141   JI = 1,3
      IEX = 1000 **(JI - 1)
      NTEMP(JI) = MOD(NFPRT1(I)/IEX,1000)
15141 NTEMP(JI+3) = MOD(NFPRT2(I)/IEX,1000)
      JTEMP = KPREF1(NTYPE)
      IF (NTEMP(JTEMP))  1515,1515,1513
 1515 IF (KPREF2(NTYPE))  1543,1543,1516
 1516 JTEMP = KPREF2(NTYPE)
      IF (NTEMP(JTEMP))  1543,1543,1513
 1513 J = 1
  152 IF (ITHPRT(J)-NSAVE)  153,1521,153
 1521 IF (DFTPRT(J)-DRAFT(NTYPE)) 153,1522,1522
 1522 IF (KPREF1(NTYPE))  155,155,15221
15221 DO 15222   JI = 1,3
      IEX = 1000 **(JI - 1)
      NTEMP(JI) = MOD(NFPRT1(J)/IEX,1000)
15222 NTEMP(JI+3) = MOD(NFPRT2(J)/IEX,1000)
      JTEMP = KPREF1(NTYPE)
      IF (NTEMP(JTEMP))  1523,1523,155
 1523 IF (KPREF2(NTYPE))  153,153,1524
 1524 JTEMP = KPREF2(NTYPE)
      IF (NTEMP(JTEMP))  153,153,155
  153 J = J + 1
      IF (J - NNPORT)  152,152,154
  154 IF (SAVEI - SAVEJ) 1542,1542,1541
 1541 SAVEJ = SAVEI
      KSAVE = I
 1542 SAVEI = 0
 1543 I = I + 1
      IF (I - NNPORT)  151,151,1544
 1544 IF (SAVEJ)  160,160,128
  155 MSAVE = J + 100 * T
      GO TO 159
  156 IF ( MOD(KGOGN1(K),10000) - MSAVE)  158,1561,153
 1561 L = 1
      LSAVE = MOD(KGOGN1(K)/10000,10)
 1562 IF (LSAVE - KCARG(L))  1563,157,1563
 1563 L = L + 1
      IF (L - 5)  1562,1562,153
  157 SAVEI = SAVEI +CGOGN3(K)
  158 K = K + 1
  159 IF (K - NKGOGN)  156,156,154
  160 JSAVE = TIME + TTRAN + SAVTIM + TDLA(NPORT)
      IF (JSAVE - 320)  1602,1602,1601
```

```
1601 JSAVE = 320
     GO TO 1604
1602 IF (TTRAN - 1. )    1603,1604,1604
1603 JSAVE = JSAVE + 1
1604 NSAVE = MOD(ISHIP(IDSHIP),100000000 )
     ISHIP(IDSHIP) = JSAVE * 100000000  + NSAVE
     GO TO 117
 170 I = 1
     DO 1700 JJ = 1,10
1700 NNFAC(JJ) = 0
     KK = NPITIN(ITINN)
 171 NNFAC(I) = MOD(NPITN1(ITINN)/100**(I-1),100)
     I = I + 1
     IF (I-5)  171,171,172
 172 IF (KK - 5)  173,173,1721
1721 I = 1
1722 NNFAC(I+5) = MOD(NPITN2(ITINN)/100**(I-1),100)
     I = I + 1
     IF (I - KK + 5)     1722,1722,173
 173 JJ = 1
 174 IF (NNFAC(JJ) - NPORT)  1741,1744,1741
1741 JJ = JJ + 1
     IF (JJ - KK) 174,174,1742
1742 WRITE (6,1743)
     CALL ENDGAM
1744 KSAVE = JJ
     IF (KOWNER - 1)  175,180,175
 175 II = 2
1751 JJ = JJ + 1
     IF (JJ - KSAVE) 177,1762,177
 176 IF (SHPWT - CAPACW(NTYPE)) 1761,1762,1762
1761 IF (SHPVOL-.80*CAPACV(NTYPE)) 1751,1762,1762
1762 IF (KSAVE - KK)  1764,1763,1764
1763 I = 1
     GO TO 1765
1764 I = KSAVE + 1
1765 KSAVE = NNFAC(I)
     ISHIP2(IDSHIP) = MOD(ISHIP2(IDSHIP),100000000) + I * 100000000
     GO TO 128
 177 IF (JJ - KK)  1772,1772,1771
1771 JJ = 1
     IF (JJ - KSAVE)     1772,1762,1772
1772 J = 1
     I = NNFAC(JJ)
     CALL LOAD
     GO TO 176
 180 IF (KSAVE - KK)  1801,1802,1801
1801 I = KSAVE + 1
     GO TO 1803
1802 I = 1
1803 NEXT = NNFAC(I)
     ISHIP2(IDSHIP) = MOD(ISHIP2(IDSHIP),100000000) + I * 100000000
     ISAVE = 10. * ( TIME + 10.)
     NNFAC(JJ) = 0
     J = NEVENT
 181 IF (MOD(KEVENT(J),10000) - ISAVE)  1811,1811,190
1811 NSAVE = MOD(KEVENT(J)/100000,100)
```

```
      IF (NSAVE - 1)  182,1822,182
  182 IF (NSAVE - 2)  1821,1822,1821
 1821 J = J - 1
      IF (J)  181,190,181
 1822 JSAVE = KEVENT(J)/10000000
      IF (MOD(ISHIP(JSAVE)/1000000,100) - NPORT)    1821,1824,1821
 1824 NSAVE = MOD(ISHIP2(JSAVE)/100,10)
      MSAVE = MOD(ISHIP(JSAVE),100)
      IF (NSAVE - ITHPRT(NPORT) )    1826,1821,1826
 1826 IF (MOD(ISHIP(JSAVE)/100,10) - 1)    1829,1821,1829
 1829 IF (MOD(ISHIP(JSAVE) / 10000,100) )   1830,1830,1821
 1830 I = 1
 1831 JSAVE = NNFAC(I)
      IF (JSAVE) 1832,1845,1832
 1832 IF (ITHPRT(JSAVE)- NSAVE)    1845,1833,1845
 1833 IF (DFTPRT(JSAVE) - DRAFT(MSAVE))  1845,1834,1834
 1834 IF (KPREF1(MSAVE) )    1844,1844,1835
 1835 DO 18361 K=1,3
      IEX = 1000 ** (K - 1)
      NTEMP(K) = MOD(NFPRT1(JSAVE)/IEX,1000)
18361 NTEMP(K+3) = MOD (NFPRT2(JSAVE)/IEX,1000)
      JTEMP = KPREF1(MSAVE)
      IF (NTEMP(JTEMP) )     1836,1836,1844
 1836 IF (KPREF2(MSAVE))    1845,1845,1837
 1837 JTEMP = KPREF2(MSAVE)
      IF (NTEMP(JTEMP))     1845,1845,1844
 1844 NNFAC(I) = 0
 1845 I = I + 1
      IF (I - KK)  1831,1831,1021
  190 II = 3
      JJ = KSAVE
 1901 JJ = JJ + 1
      IF (JJ - KSAVE)  196,193,196
  191 IF (SHPWT - CAPACW(NTYPE)) 192,193,193
  192 IF (SHPVOL-.80*CAPACV(NTYPE)) 1901,193,193
  193 NSAVE = MOD(ISHIP(IDSHIP),1000000)
      ISHIP(IDSHIP) = NSAVE + NEXT * 1000000
      GO TO 1171
  196 IF (JJ-KK)  1962,1962,1961
 1961 JJ = 1
      IF (JJ - KSAVE)     1962,193,1962
 1962 IF (NNFAC(JJ))  197,1901,197
  197 J = 1
      I = NNFAC(JJ)
      CALL LOAD
      GO TO 191
  461 FORMAT(/10X,4HAT  ,F5.1,16H DAYS, SHIP NO. ,I3,18H ARRIVED AT PORT
     1  ,I2,34H  TO JOIN QUEUE FOR FACILITY TYPE ,I2)
  501 FORMAT(/10X,4HAT  ,F5.1,16H DAYS, SHIP NO. ,I3,15H ENTERING PORT ,
     1I2,11H FROM QUEUE)
 1181 FORMAT(/10X,4HAT  ,F5.1,16H DAYS, SHIP NO. ,I3,18H ARRIVED AT PORT
     1  ,I2,22H SERVICED AT FAC. TYPE,I2, 5H FOR , F5.2,5H DAYS,12H,FINA
     2L VOL = F6.0, 8H MT,PCT= F4.0 )
  146 FORMAT(///10H SHIP NO. , I4, 18H LEAVING PORT NO. , I3, 45H WITH N
     10 CARGO FOR ASSIGNED DELIVERY THEATER, I3 )
 1743 FORMAT(///80H YOUR ERROR IS THAT CURRENT PORT IS NOT ON SHIP'S ITI
     1NERARY IN THE PRESENT EVENT ///)
```

```
*DECK PRINT1
      SUBROUTINE PRINT
      COMMON
     1 NSTYPE,NNPORT,NFTYPE,NTHEA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(410),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IOSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSFA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),XARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NEPRT1(30),NEPRT2(30),ITHPRT(30),TOLA(30),ADJPRT(30),CSTHOL(30),
     2 DETPRT(30),TTRAN,KEPRT1(30),KEPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,QSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(480),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLO,
     3 ADJCGO(8)
      COMMON
     1 KARGOL(30,8,6),NOPORT(30),NPREAC(30,6),KPGSHP(30,8),TOPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      COMMON/SEL/IKE(30)
      DIMENSION NTAB1(100),NTAB2(100),NTAB3(100),TTAB4(100)
      COMMON/NNTAB/NTAB(200),NT
      DIMENSION  NEAC(8),NTOTYP(8) ,TEMP(6,6)
      COMMON/C/ KRGD(40),NPOOLM(40),NTSTOP
      LVENT1=0
      LVENT2=5
      LVENT3=0
      TVENT=TIME+TEVAL
      CALL PUT
       IF (IOUT) 2,2,3
3     WRITE(6,101)
2     KRGSCB=0
      KRGDCB=0
      KRGGCB=0
      DO 4  I=1,8
 4    NTOTYP(I) = 0
      NF = 1
      SAVE = QSTSYS/1000000.
      IF (ISW                                          5,10,5
    5 WRITE (6,102)  TIME
   10 WRITE (6,103)  TIME, SAVE, NPOOL
      I=1
      IF (IKE(1).NE.1) GOTO 88
15     IF(IOUT) 11,11,12
11     WRITE(6,13)  I,(PRTNAM(I,K),K=1,2       )
       GO TO 14
12    WRITE (6,104)  I, (PRTNAM(I,K),K=1,2)
14    DO 16  K = 1,6
      NEAC(K) = 0
      DO 16 J = 1,8
   16 NEAC(K) = KARGOL(I,J,K) + NEAC(K)
      K = 1
       IF (IOUT) 21,21,20
21      WRITE(6,17)
```

```
      GO TO 25
   20 WRITE (6,105) (ONRNAM(K,J), J=1,2), (KARGDL(I,J,K), J=1,8),NFAC(K)
      K = K + 1
      IF (K - 6 )                                          20,20,25
   25 DO 26  K = 1,8
      NFAC(K) = 0
      DO 26  J = 1,6
   26 NFAC(K) = NFAC(K) + KARGDL(I,K,J)
      NTOTAL = 0
      DO 27  K = 1,8
      NTOTYP(K) = NTOTYP(K) + NFAC(K)
   27 NTOTAL = NTOTAL + NFAC(K)
         IF (IOUT)  271,271,272
  271    WRITE(6,274) ( NFAC(K), K=1,8), NTOTAL
         GO TO 273
  272    WRITE(6,112) ( NFAC(K), K=1,8), NTOTAL
  273      KRGDCB=  KRGDCB+ NTOTAL
         ITEMP = 0
         DO 28  J=1,8
   28    ITEMP = ITEMP + KRGGEN(I,J)
         KRGGCB = KRGGCB + ITEMP
          IF (IOUT) 281,281,282
  281    WRITE(6,284)(KRGGEN(I,J),J=1,8),ITEMP
          GO TO 283
  282    WRITE (6,113) I
         WRITE (6,107) (KRGGEN(I,J),J=1,8),ITEMP
  283    ITEMP = 0
         DO 29  J = 1,8
   29    ITEMP = ITEMP + KRGSHP(I,J)
         KRGSCB = KRGSCB + ITEMP
          IF(IOUT)  291,291,292
  291    WRITE(6,294)(KRGSHP (I,J),J=1,8),ITEMP
          GO TO 293
  292    WRITE (6,106)  I
         WRITE (6,107)  (KRGSHP(I,J), J=1,8) ,ITEMP
         WRITE (6,108)  T
         WRITE (6,109)  (NPRFAC(I,J), J=1,NFTYPE)
  293     J=1
   30 NFAC(J) = MOD( KFPRT1(I)/1000**(J-1),1000)
      J = J + 1
      IF (J - 3)                                           30,30,35
   35 NFAC(J) = MOD( KFPRT2(I)/1000**(J-4),1000)
      J = J + 1
      IF (J - NFTYPE)                                      35,35,40
   40 IF (NQUEUF)                                          50,70,50
   50 K = 1
   55 IF ( MOD(KQUEUE(K),100) - T )                        65,60,70
   60 L =   MOD(KQUEUE(K)/100000,10)
      NFAC(L) = NFAC(L) + 1
   65 K = K + 1
      IF ( K - NQUEUE )                                    55,55,70
   70       IF(IOUT)  71,71,72
   72    WRITE (6,110)  I
         WRITE (6,109)  (NFAC(J), J=1,NFTYPE)
   71    JSAVE = 0
         J = 1
   75 JSAVE = JSAVE + NPRFAC(I,J)
```

```
      J = J + 1
      IF (J - NFTYPE)                                    75,75,80
   80 SAVE = JSAVE
      SAVE2 = NQPORT(I)
       IF(SAVE.LE.0.) GO TO 86
      SAVE =(SAVE2 / SAVE) * 100.
   86 IF(SAVE2.LE.0.) GO TO 87
      SAVE2 = TQPORT(I) / SAVE2
 87       IF(IOUT)  870,870,871
 871  WRITE (6,111)  I, SAVE, SAVE2
 870  MF =MF + 1
      IF (IKE(MF).EQ.0) GOTO 99
      IF (MF.GT.30) GOTO 99
        IF(IOUT.LE.0)  GO TO 88
      WRITE (6,101)
  88  I=I+1
      IF (I.EQ.IKE(MF)) GOTO 15
      GOTO 88
 99       IF(IOUT)  991,991,992
 991  WRITE (6,116) (NTOTYP(I),I=1,8)
 992  WRITE (6,115)  KRGGCB,KRGSCB,KRGDCB
       MIME = TIME
      MMIME=MIME/5
      NPOOLM(MMTME)=NPOOL
      KRGD(MMIME)=KRGDCB
      NTSTOP=TSTOP
       IF(IOUT.LE.0)  GO TO 1000
      WRITE (6,181)
      WRITE (6,117)
1000  DO 100   I = 1,NSTYPE
        SAVE=0.
       IF(TVOLAV(I).LE.0.) GO TO 100
      SAVE = 100. * TVOLUS(I) / TVOLAV(I)
       IF(IOUT.LE.0)  GO TO 100
      WRITE(6,118) I, SAVE
100           CONTINUE
      DO 150   I = 1,NTHEA
      DO 150   J = 1,NTHEA
       TEMP(I,J)=0.
       IF(TVAV(I,J).LE.0.) GO TO 150
      TEMP(I,J) = 100. * TVUS(I,J) / TVAV(I,J)
  150 CONTINUE
      IF(IOUT.LE.0)   GO TO  152
      WRITE(6,119)
      DO 151   I = 1,NTHEA
  151 WRITE(6,120) I,(TEMP(I,J),J=1,NTHEA)
152   SAVE = 0.
      SAVE2 = 0.
      WRITE (6,117)
      DO 155  I = 1,NSTYPE
      SAVE = SAVE + TVOLUS(I)
  155 SAVE2 = SAVE2 + TVOLAV(I)
        IF(SAVE2.LE.0.) GO TO 156
      SAVE = 100. * SAVE/SAVE2
  156 WRITE(6,114) SAVE
      WRITE(6,101)
      DO 1561 I=1,N
```

```
      NTAB1(I)=NTAB(I)/1000000000
      NTAB2(I)=MOD(NTAB(I)/10000000,100)
      NTAB3(I)=MOD(NTAB(I)/100000,100)
      TTAB4(I)=MOD(NTAB(I),100000)
 1561 CONTINUE
      IF(IOUT.LE.0)   GO TO  1562
      WRITE(6,1560)((NTAB1(J),NTAB2(J),NTAB3(J),TTAB4(J)),J=1,NT)
      RETURN
 1562 NT=0
  101 FORMAT(1H1)
  102 FORMAT(///47X,3HAT ,F5.1,37H DAYS,    T H E   G A M E   E N D E D)
  103 FORMAT(///46X,33HS Y S T E M   S T A T U S   A T  ,F5.1,9H  D A Y
     1S//26X,24HCUMULATIVE SYSTEM COST =,F8.3,9H  (MIL $),10X,33HCURRENT
     2 NUMBER OF SHIPS IN POOL =,I4///54X,31HP O R T   I N F O R M A T I
     3 O N)
  104 FORMAT(//49X,25HCARGO DELIVERED TO PORT  ,I2,2X,2A6,
     1                                          15H  BY TYPE  (MT)//
     265X,10HCARGO TYPE/28X,5HOWNER, 15X,2H 1,7X,2H 2,7X,2H 3,7X,2H 4,7X
     3,2H 5,7X,2H 6,7X,2H 7,7X,2H 8,6X,5HTOTAL)
  105 FORMAT(/25X,2A6,6X,8I9,I10)
  106 FORMAT(// 41X,41HTOTAL AMOUNT OF CARGO SHIPPED FROM PORT  ,I2,15H
     1 BY TYPE  (MT)/39X,2H 1,7X,2H 2,7X,2H 3,7X,2H 4,7X,2H 5,7X,2H 6,7X
     2,2H 7,7X,2H 8,6X,5HTOTAL )
  107 FORMAT(34X,8I9,I10 )
  108 FORMAT(//41X,37HNUMBER OF SHIPS THAT HAVE USED PORT  ,I2,18H  BY F
     1ACILITY TYPE/55X,2H 1,5X,2H 2,5X,2H 3,5X,2H 4,5X,2H 5,5X,2H 6)
  109 FORMAT(51X,6I7)
  110 FORMAT(// 29X,61HNUMBER OF SHIPS(INCLUDING THOSE IN QUEUE) CURRENT
     1LY AT PORT  ,I2,18H  BY FACILITY TYPE/55X,2H 1,5X,2H 2,5X,2H 3,5X,
     22H 4,5X,2H 5,5X,2H 6)
  111 FORMAT(// 30X,58HPERCENTAGE OF SHIPS THAT HAD TO WAIT TO DISCHARGE
     1 AT PORT ,I2,5H  =  ,F5.1, 9H PER CENT/ 46X,36HMEAN WAITING TIME O
     2F THESE SHIPS =  ,F5.1,7H  DAYS )
  112 FORMAT(/32X,5HTOTAL,6X,8I9,I10)
  113 FORMAT(// 41X,41HTOTAL AMOUNT OF CARGO GENERATED AT PORT  ,I2,15H
     1 BY TYPE  (MT)/39X,2H 1,7X,2H 2,7X,2H 3,7X,2H 4,7X,2H 5,7X,2H 6,7X
     2,2H 7,7X,2H 8,6X,5HTOTAL )
  114 FORMAT ( 40X, 2H= , F6.1)
  115  FORMAT(  /,25X,12HCARGO TOTALS  , 5X,33HTOTAL AMOUNT OF CARGO GENE
     1RATED = I12/42X,33HTOTAL AMOUNT OF CARGO SHIPPED  = I12/42X,33HTO
     2TAL AMOUNT OF CARGO DELIVERED = I12/ )
  116 FORMAT( /41X,40HCUMULATIVE DELIVERED CARGO BY TYPE  (MT)/38X,2H 1,
     17X,2H 2,7X,2H 3,7X,2H 4,7X,2H 5,7X,2H 6,7X,2H 7,7X,2H 8/34X,8I9)
  117  FORMAT(// ,24X,74HPER CENT OF SHIP VOLUME USED BY NON-ITINERARY SH
     1IPS LEAVING HOME THEATER      //)
  118 FORMAT (30X,10HSHIP TYPE  I6, 14H  USED VOLUME F6.1)
  119  FORMAT(///,25X,74HPER CENT OF SHIP VOLUME USED BY NON-ITINERARY SH
     1IPS LEAVING HOME THEATER      //40X,19HDESTINATION THEATER/ 25X,
     26HORIGIN,6X,1H1,9X,1H2,9X,1H3,9X,1H4,9X,1H5,9X,1H6/25X,7HTHEATER )
  120 FORMAT (28X,I1,4X,6(F6.1,4X) )
 1560 FORMAT(25X,49HSHIP TYPE,5X,11HORIGIN PORT,5X,16HDESTINATION PORT,5X
     C,3HETA//(29X,I2,12X,I2,17X,I2,11X,F5.1))
   13  FORMAT(/50X,*PORT    *,I2,3X,2A6)
   17   FORMAT(25X,*CARGO TYPE*,11X,*1*,8X,*2*,8X,*3*,8X,*4*,8X,*5*,8X,*6
     C*,8X,*7*,8X,*8*)
  274  FORMAT(25X,*TOTAL DELIVERED *,8I9,I10)
  284  FORMAT(25X,*TOTAL GENERATED *,8I9,I10)
```

```
*DECK PUT1
      SUBROUTINE PUT
      COMMON
     1 NSTYPE,NNPORT,NETYPE,NTWEA,NITIN,TFVAL,TSTOP,NSHTP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(410),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IOSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(408),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NEPRT1(30),NEPRT2(30),ITHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPRT(30),TTRAN,KEPRT1(30),KEPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGC,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGDL(30,8,6),NOPORT(30),NPREAC(30,6),KRGSHP(30,8),TOPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      TIMETT = 10. * TVENT
      KTP = TIMETT
      KTEMP = ((( LVENT1*100 + LVENT2) * 10 + LVENT3) * 10000) + KTP
      K = NEVENT + 1
      NEVENT = K
       IF (NEVENT - 1 )                        3,3,1
 1    KTEST = MOD(KEVENT(K-1),10000)
      IF (KTEST - KTP)    2,2,3
 2    KEVENT(K) = KEVENT(K-1)
      K = K-1
      IF (K-1)   3,3,1
 3    KEVENT(K) = KTEMP
      RETURN
      END
```

```
*DECK QUEUF1
      SUBROUTINE QUEUF
      COMMON
     1 NSTYPE,NMPORT,NFTYPE,NTHEA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(4100),NEVENT, IVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,RA
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NFPRT1(30),NFPRT2(30),ITHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPRT(30),TTRAN,KFPRT1(30),KFPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGDL(30,8,6),NQPORT(30),NPRFAC(30,6),KRGSHP(30,8),TQPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      L = NQUEUE
      IF (NQ3)  20,1,20
 1    M = 1
 5    LSAVE = MOD(KQUEUE(M),100)
      IF (LSAVE - NQ1)  3,4,99
 4    MSAVE = MOD(KQUEUE(M)/100000,10)
      IF (MSAVE - NQ2)  3,6,3
 3    M = M+1
      IF (M-L)  5,5 ,99
 6    NQ3 = KQUEUE(M)
 7    KQUEUE(M) = KQUEUE(M+1)
      M = M+1
      IF (M-L)  7,7,8
 8    NQUEUE = NQUEUE - 1
      GO TO 99
 20   IF (L) 21,24,21
 21   LSAVE = MOD(KQUEUE(L),100)
      IF (NQ1-LSAVE)  22,23,24
 22   KQUEUE(L+1) = KQUEUE(L)
      L = L-1
      GO TO 20
 23   MSAVE = MOD(KQUEUE(L)/100000,10)
      IF (NQ2-MSAVE)  22,24,24
 24   KQUEUE(L+1) = NQ3
      NQUEUE = NQUEUE + 1
      NQPORT(NQ1) = NQPORT(NQ1) + 1
 99   RETURN
      END
```

```
*DECK RING1
      SUBROUTINE RNG
      COMMON
     1 NSTYPE,NNPORT,NFTYPE,NTHEA,NITIN,TEVAL,TSTOP,NSHIP,RDENT(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,6),DIST(30,30),NKTIME(6,6),TIME,
     3 KEVENT(410),NEVENT, IVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACW(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITH1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NEPRT1(30),NEPRT2(30),ITHPRT(30),TDLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPRT(30),TTRAN,KEPRT1(30),KEPRT2(30),ADJRAT,PRTRAN(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUE,KQUEUE(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGDL(30,8,6),NOPORT(30),NPREAC(30,6),KRGSHP(30,8),TOPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TWAV(6,6),TWUS(6,6)
      COMMON/A/ ONRNAM(6,2)
      SAVE = RN * 37.
      ISAVE = SAVE
      SAVE1 = ISAVE
      RN = SAVE - SAVE1
      RETURN
      END
```

```
*DECK TAKE1
      SUBROUTINE TAKE
      COMMON
     1 NSTYPE,NNPORT,NFTYPE,NTMEA,NTTIN,TEVAL,TSTOP,NSHIP,PGENY(12),
     2 CSTADM(6),CSTTON(8),PRODUC(6,6,8),DIST(30,30),KKTIME(6,6),TIME,
     3 KEVENT(410),NEVENT, TVENT,LVENT1,LVENT2,LVENT3,IDSHIP,KWORD,RN
      COMMON
     1 SPEED(25),CAPACH(25),CAPACV(25),CSTSEA(25),CSTPRT(25),DRAFT(25),
     2 KTRANS(25),ADJTRN(25),KARSHP(25),ISHIP(400),ISHIP2(400),
     3 NPITIN(10),NPITN1(10),NPITN2(10),NTITN1(10),NTITN2(10),
     4 KPREF1(25), KPREF2(25),KCHANG(25)
      COMMON
     1 NFPRT1(30),NFPPT2(30),ITHPRT(30,30),TOLA(30),ADJPRT(30),CSTHDL(30),
     2 DFTPPT(30),TTRAN,KFPRT1(30),KFPRT2(30),ADJRAT,PRTNAM(30,2)
      COMMON
     1 NKARGO,KARGO(4000),ISW,CSTSYS,NQ1,NQ2,NQ3,NQUEUF,KQUEUF(400),
     2 KGOGN1(1000),KGOGN2(1000),CGOGN3(1000),KGOGN4(1000),NKGOGN,ADJLD,
     3 ADJCGO(8)
      COMMON
     1 KARGOL(30,8,6),NOPORT(30),NPREAC(30,6),KRGSHP(30,8),TOPORT(30),
     2 KRGGEN(30,8),NPOOL,IOUT,TVOLAV(25),TVOLUS(25),TVAV(6,6),TVUS(6,6)
      COMMON/A/ ONRNAM(6,2)
    7 KWORD = KEVENT(NEVENT)
      KEVENT(NEVENT) = 0
      NEVENT = NEVENT - 1
      TP = MOD(KWORD,10000)
      TIME = TP / 10.
      IDSHIP = KWORD / 10000000
      I = MOD( KWORD / 100000, 100 )
       IF(I.GT.0.AND.I.LE.6) GO TO 12
       WRITE(6,100) TIME,IDSHIP,I
  100 FORMAT(5X,F8.1,2(1X,I4))
       GO TO 7
   12 GO TO (1,2,3,4,5,6) , I
     1 CALL MOVE
     2 CALL PORT
     3 CALL CARGEN
     4 CALL KRGEVL
     5 CALL PRINT
       GO TO 7
     6 CALL ENDGAM
       RETURN
       END
```

REFERENCE

1. "Integrated Sealift Study," Vol. 2, Appendix O, OCNO/DCND (LOG) Report (Nov 1971).

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